

ANC



POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REGD. TRADE MARK GREAT BRITAIN NO. 410426

REG. U.S. PAT.



BUILD YOUR OWN CRUISER
PAGE 218

NEW

NEW

NEW

AUTO-LITE

Resistor

SPARK PLUG

Here's what it is

The many benefits which can be obtained through a wider than standard spark gap setting are well known to the automotive industry. Up to this time the rate of spark gap increase due to electrode erosion has been such that the desired wide setting has not been generally used. Auto-Lite, working with leading car and truck manufacturers, has Ignition Engineered a built-in 10,000 Ohm Resistor which reduces electrode erosion so that Auto-Lite Spark Plugs can now be given this wider gap setting desirable for improved operation and economy.

Here's what it does

PROMOTES SMOOTHER IDLING, because the wider spark gaps help eliminate occasional missing.

REDUCES MISFIRING due to lean spots in carburetion.

ASSISTS IN BURNING OF LEANER MIXTURES for improved engine economy at idle and throughout the speed range.

REDUCES RING AND CYLINDER WEAR when lubrication is washed away by gasoline not burned as a result of occasional misses.

INCREASES ELECTRODE LIFE up to 200% and more.

SUPPRESSES SPARK PLUG INTERFERENCE with radio, radio-telephone, radar and television reception.*

Advantages So Significant They Are Expected To Affect The Entire Industry

A complete line of Auto-Lite Resistor Spark Plugs with the built-in Resistor will soon be available for original equipment and replacement on popular makes of cars, trucks and tractors. The regular line of ignition engineered Auto-Lite Spark Plugs, which has won such an enviable reputation for dependability of performance, will continue to be manufactured. Ask your favorite dealer.

THE ELECTRIC AUTO-LITE COMPANY

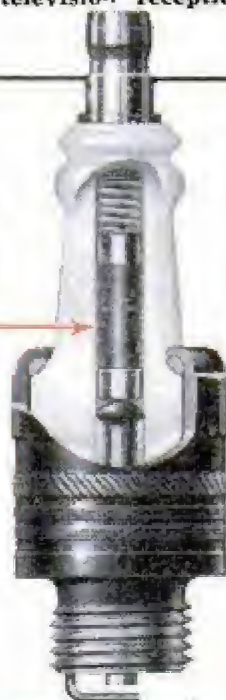
Toronto 1, Ontario

Toledo 1, Ohio

NEW

BUILT-IN RESISTOR

Auto-Lite Ignition Engineers, working with leading automotive manufacturers, have developed the new Auto-Lite Resistor Spark Plug with this built-in resistor. As a result, improved operation and economy will be possible for the owners of cars, trucks and tractors everywhere.



*Within 35 mv/m from 540 kc. to 150 mc. at 50 ft.



Typical example: user's experience with B. F. Goodrich tires

J. C. HINRICHS, JR., of Waterbury, Conn., right above, points to a tire he says he drove "across the continent to Texas and return plus almost two years of civilian driving which entailed 360 miles per week in addition to my regular business driving."

"To my knowledge," his letter continues, "this B. F. Goodrich tire has never been off its original mounting on the left front wheel. It shows considerable wear, but there is still tread visible on the entire circumference. Need you ask if I am satisfied?"

Mr. Hinrichs has an exact

record of the mileage at the time this picture was made, and it proves he takes exceptional care of his tires. This tire replaced one that had been damaged while he was away in the army. At that time his speedometer read 8560. "At this writing," he says, "my speedometer shows 72,057 miles and they have really been rough ones." That leaves a tire mileage of 63,497. No tire, no matter how good it is, ever goes that far unless it is kept at the right air pressure, with the wheel balanced and in correct alignment.

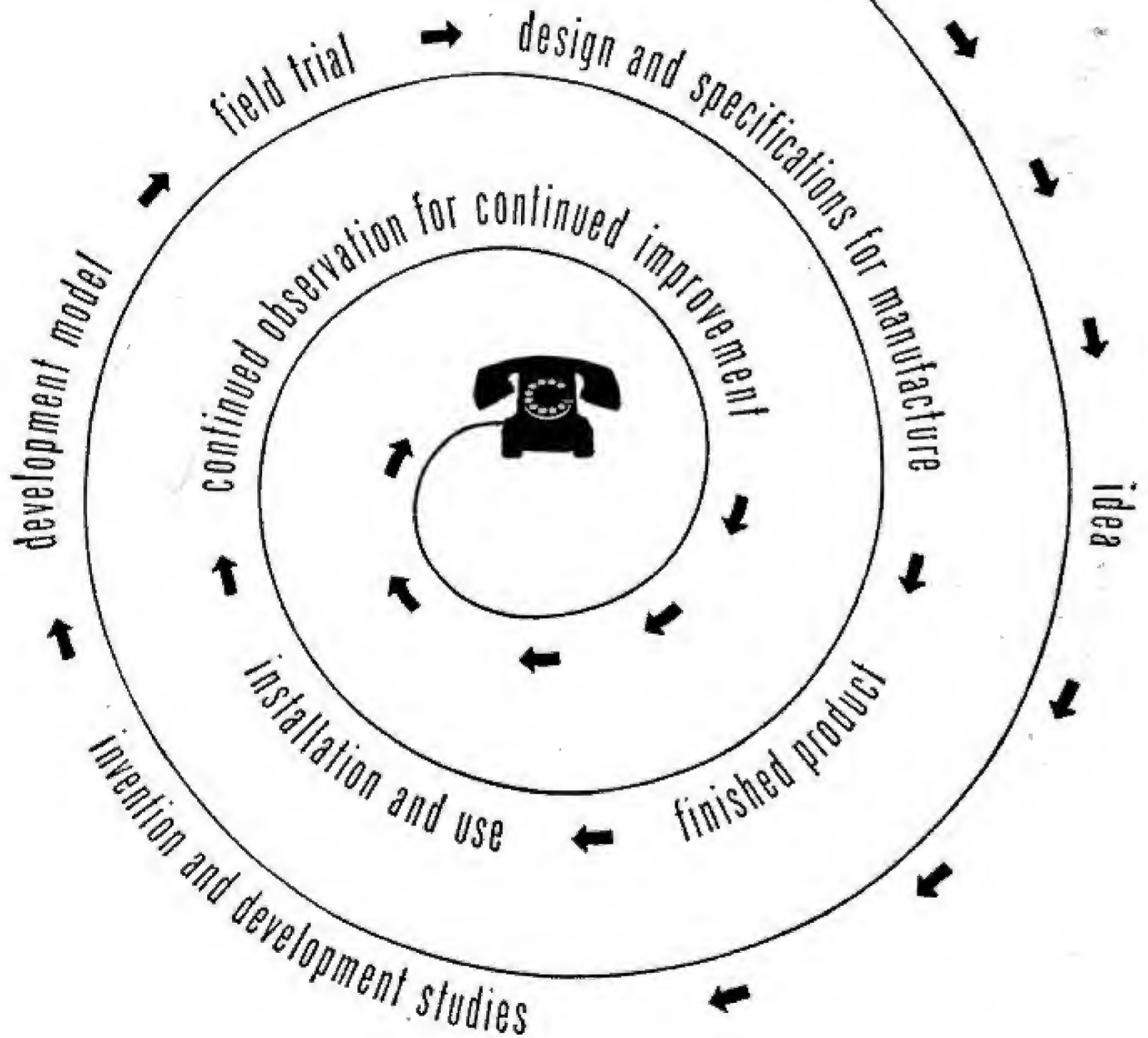
But B. F. Goodrich Silver-

towns do outwear others—and outwear prewar tires. The tread is wider and more level. This means more tread-to-road contact, better weight distribution, more even wear. A double breaker cushions shocks.

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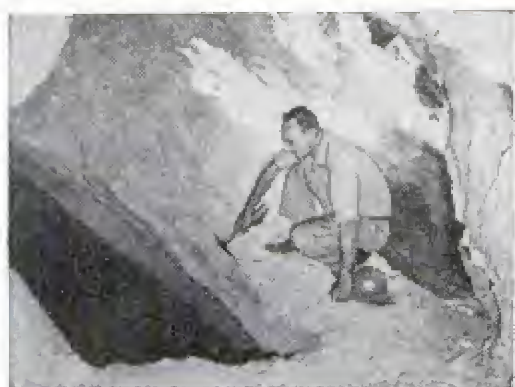
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H. H. WINDSOR, Jr., Editor and Publisher



WHEN Tom Stimson, our western editor, was gathering material for "Weekend 49ers" (page 164) he kept an alert eye for samples of stuff like gold and silver ore. He is shown above exploring an abandoned mine.

THERE are some eye-opening revelations in our opening feature, "Uncle Sam Weighs His Resources," on page 89. A recent government survey shows that although there's enough coal underground to last us 4386 years we have only enough copper for 19 years and our known reserves of lead will be gone in a decade.

SHRUB planting in the garden-er's book is just another name for spring, and next month a special feature in the Craftsman section offers expert advice on plantings for corners, terraces or in rows, for lots large or small. Another April feature lists preventive treatments for common car ills—those little things that every car owner should do periodically to avoid big repair bills. Then there's another practical story on the construction of a small cement mixer that has most of the labor-saving features of a much larger machine. One how-to-make-it article in April concerns hard-to-get novelty hardware for handbags, glove boxes or small chests.

JUNIOR radio students and experimenters will find a tapped-coil crystal set combined with a 2-tube battery-operated amplifier in the April Radio section.

Volume 89 MARCH 1948 Number 3

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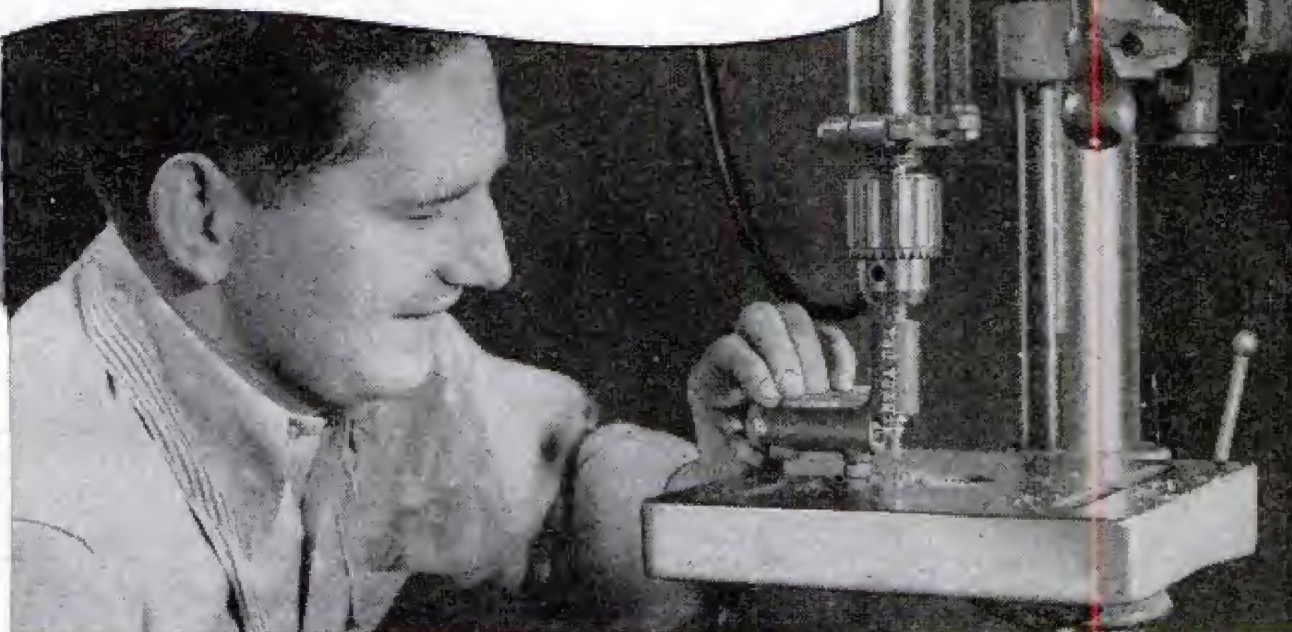
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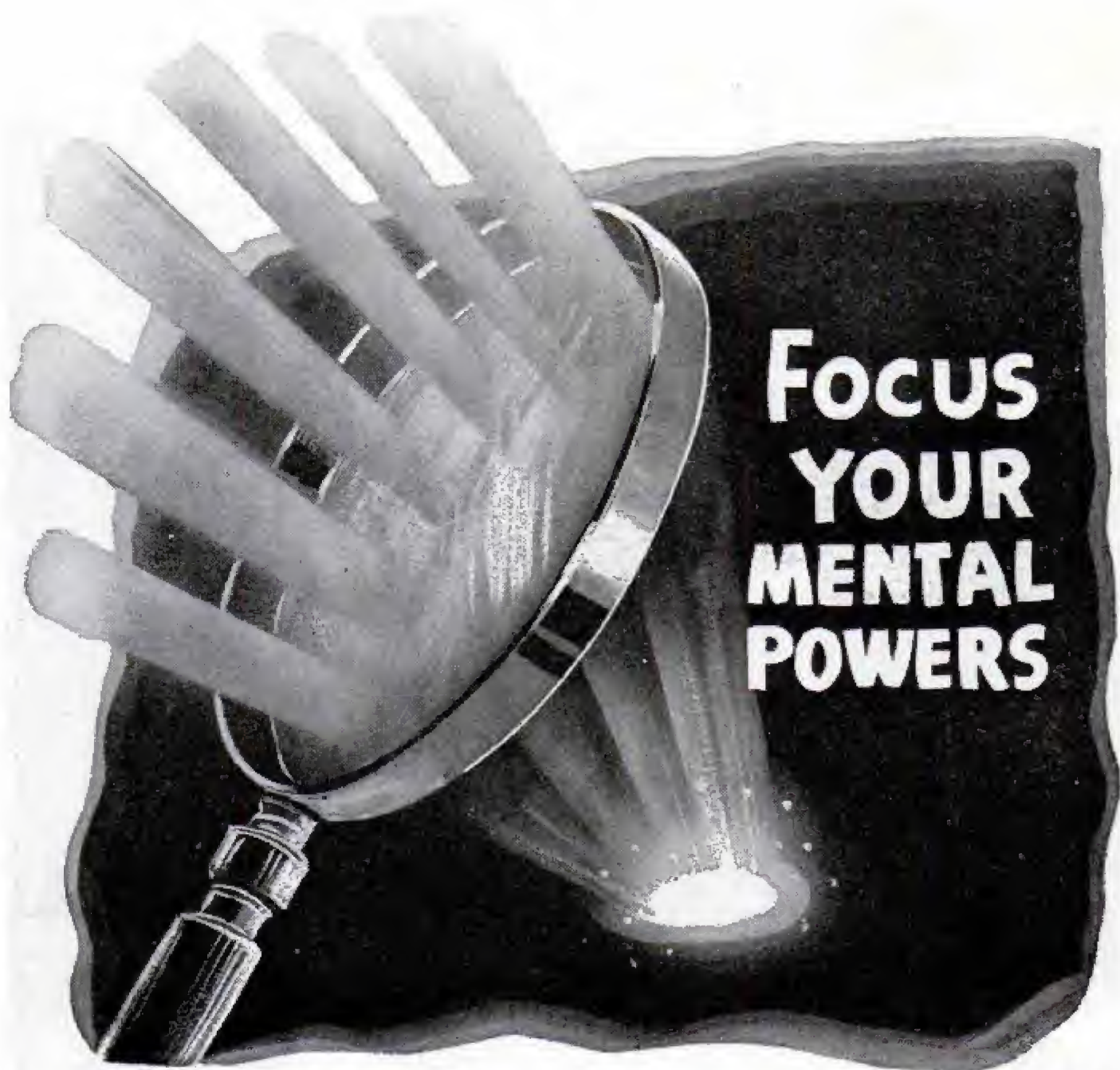


Tru-Turn Tool



AC-59





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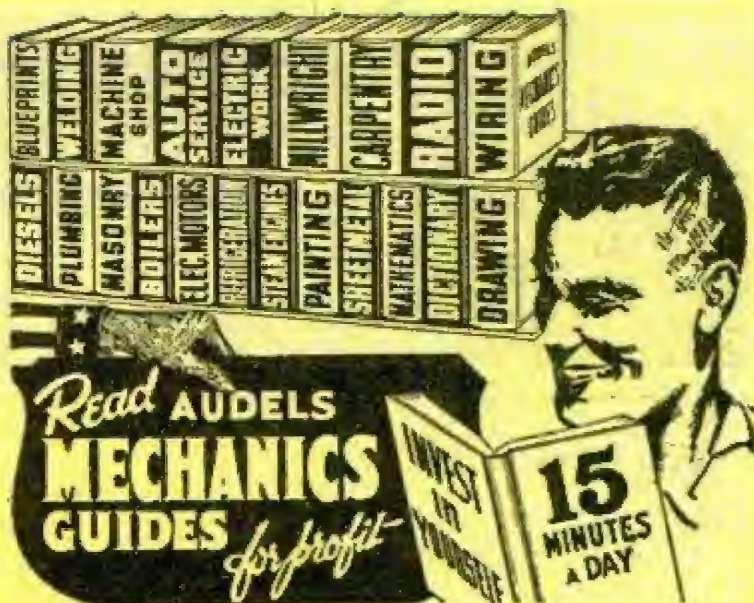
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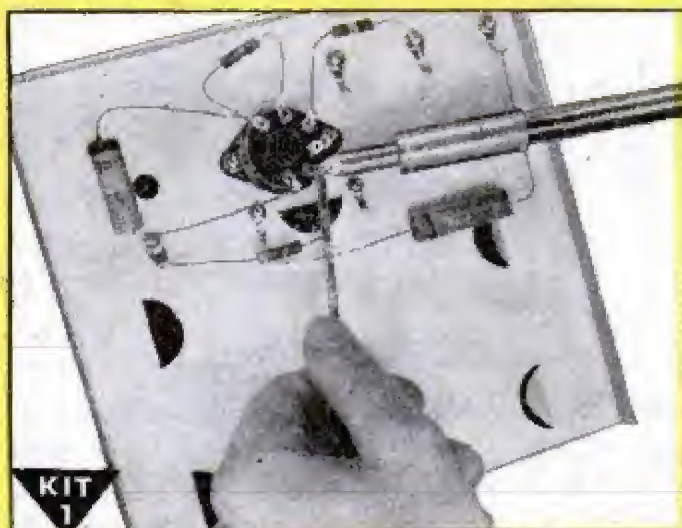
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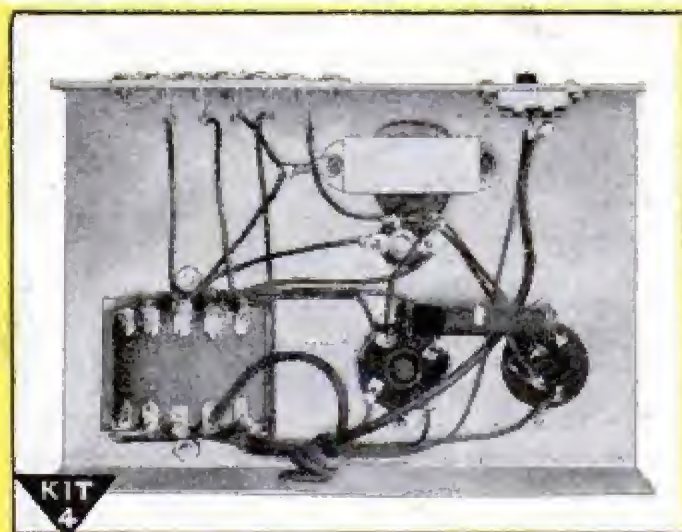
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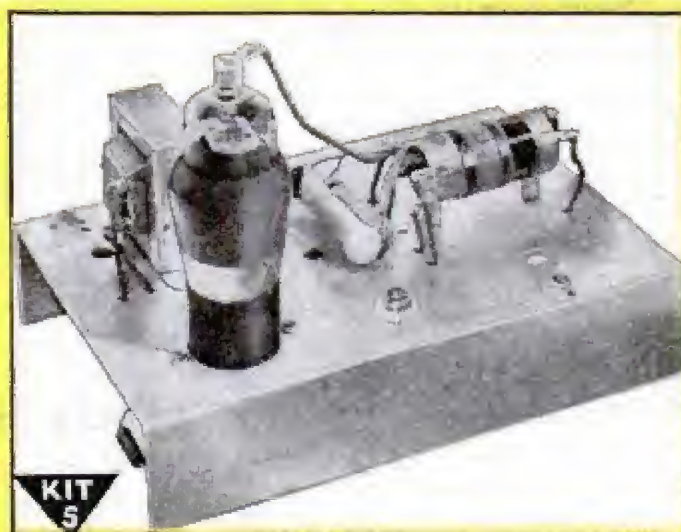
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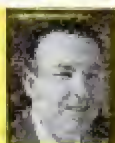
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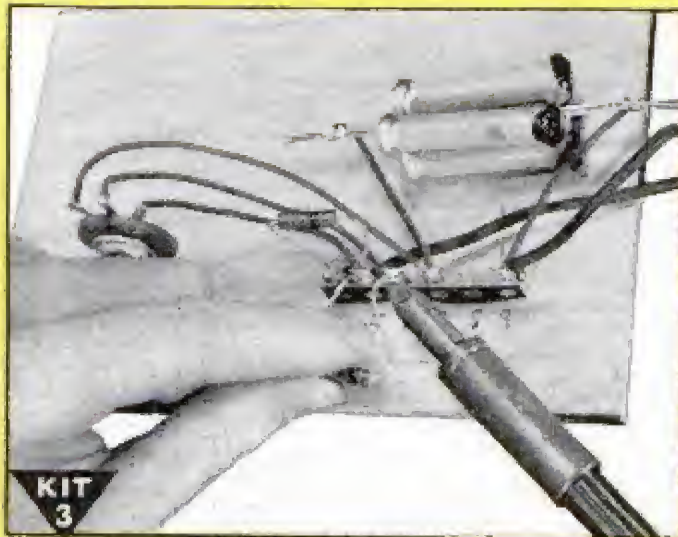
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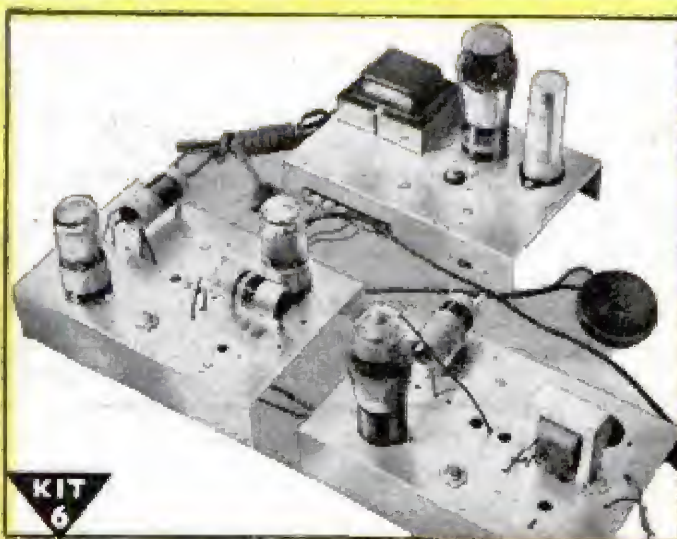
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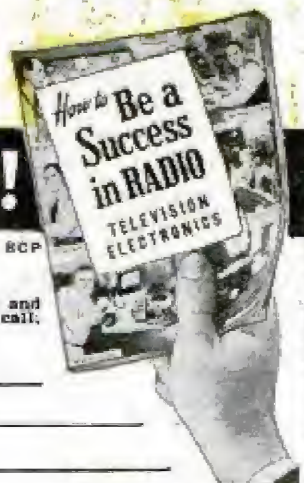
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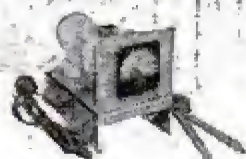
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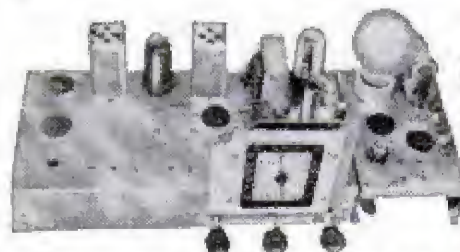
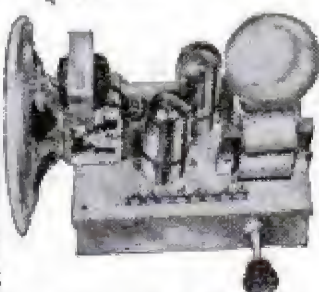
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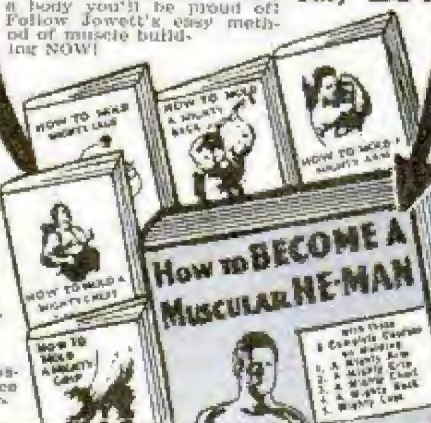
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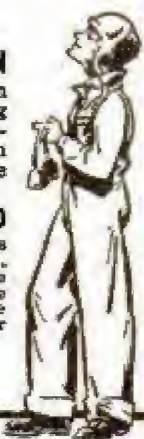
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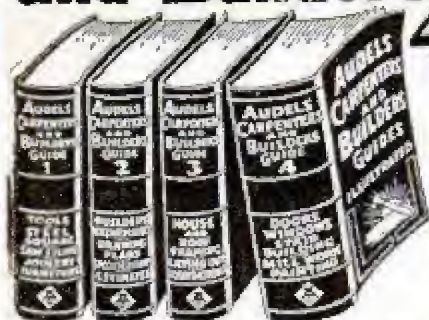
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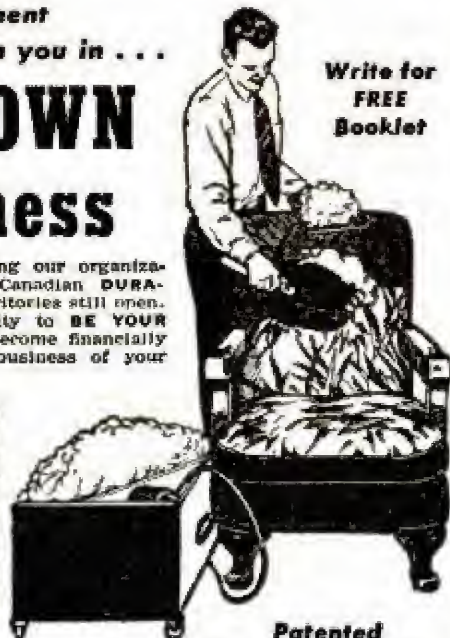
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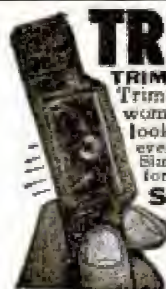
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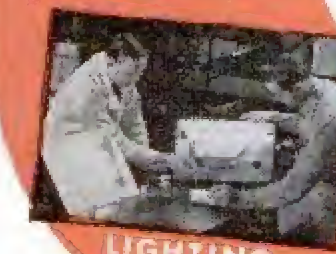
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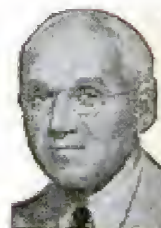
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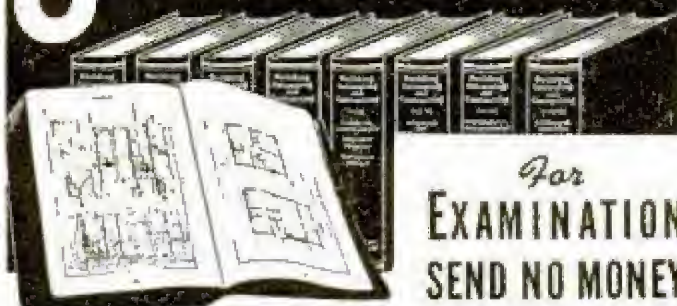
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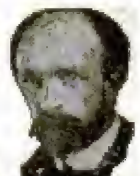
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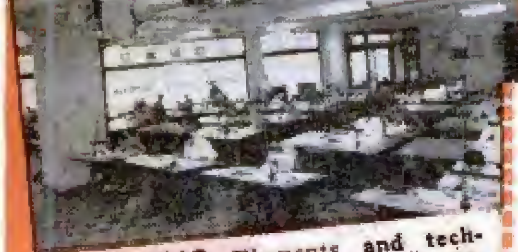


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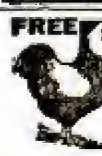
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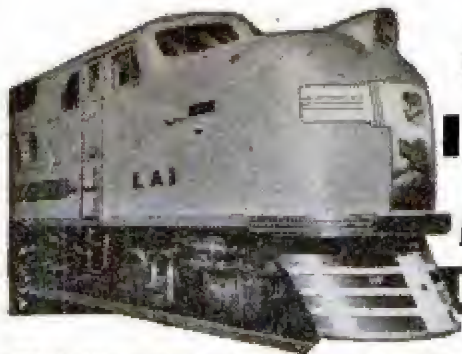
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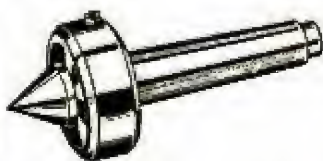
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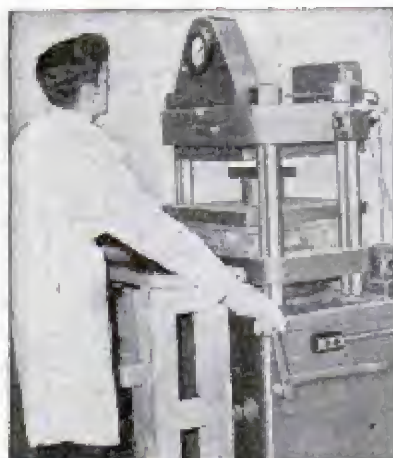
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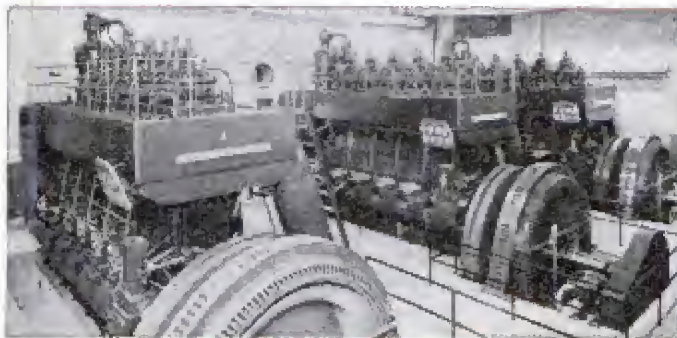
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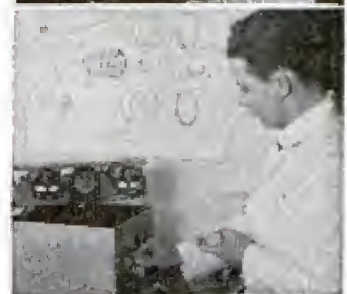
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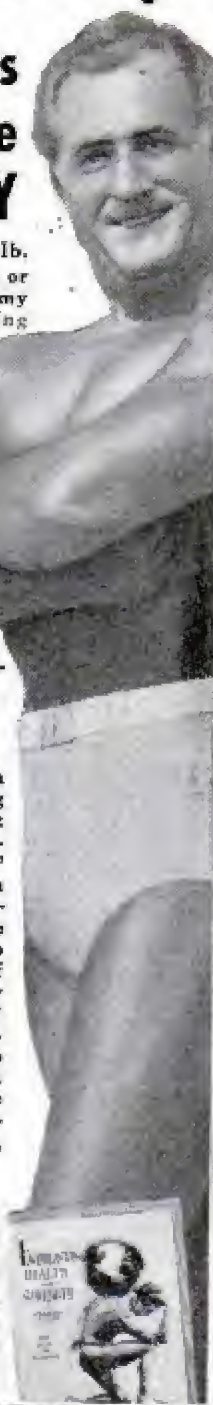
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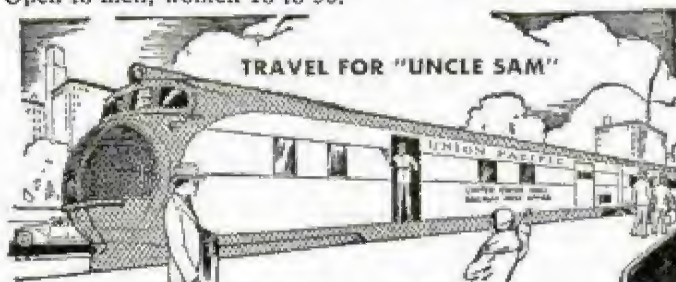
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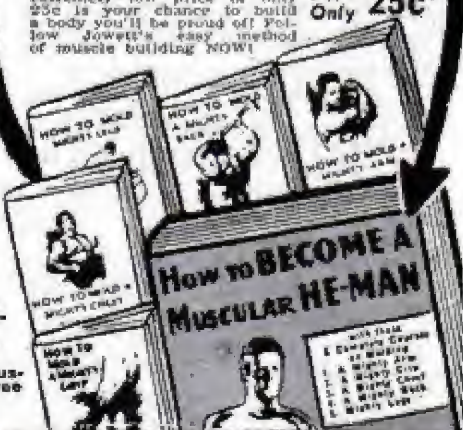
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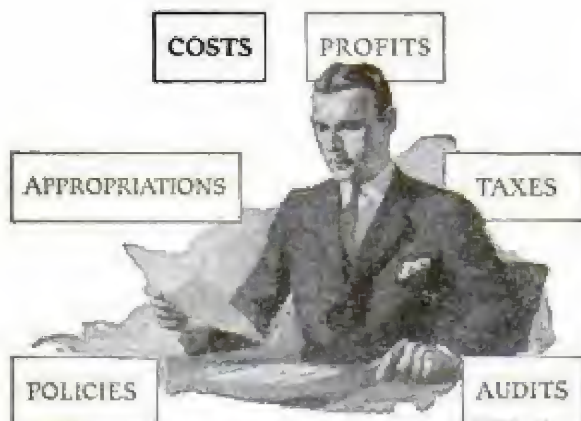
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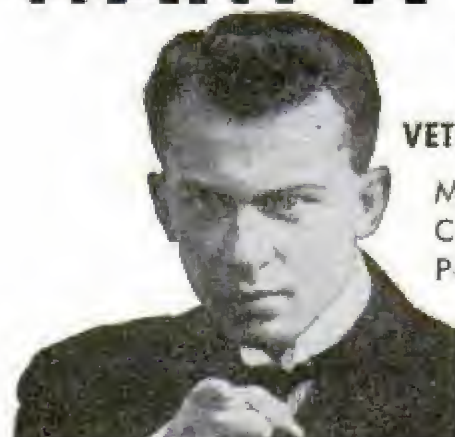
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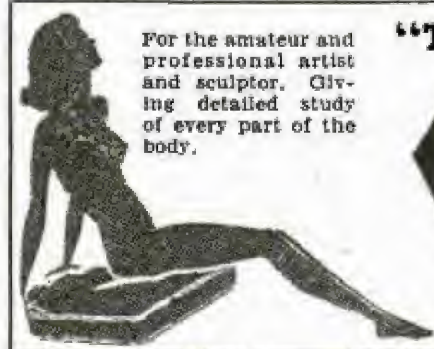
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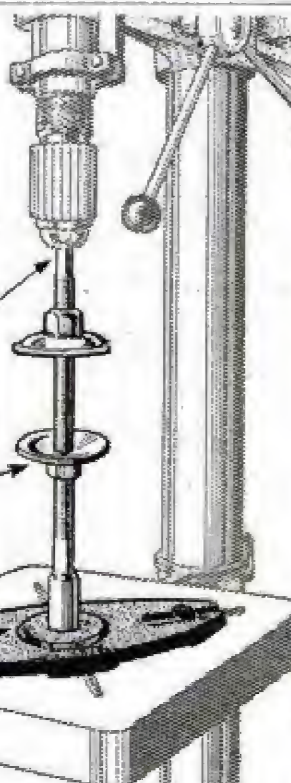
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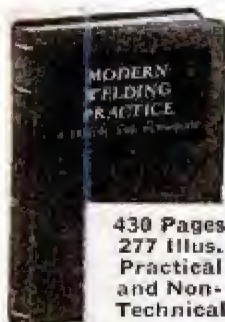
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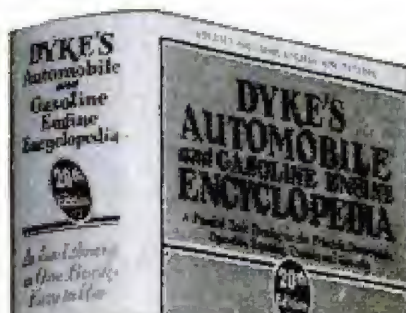
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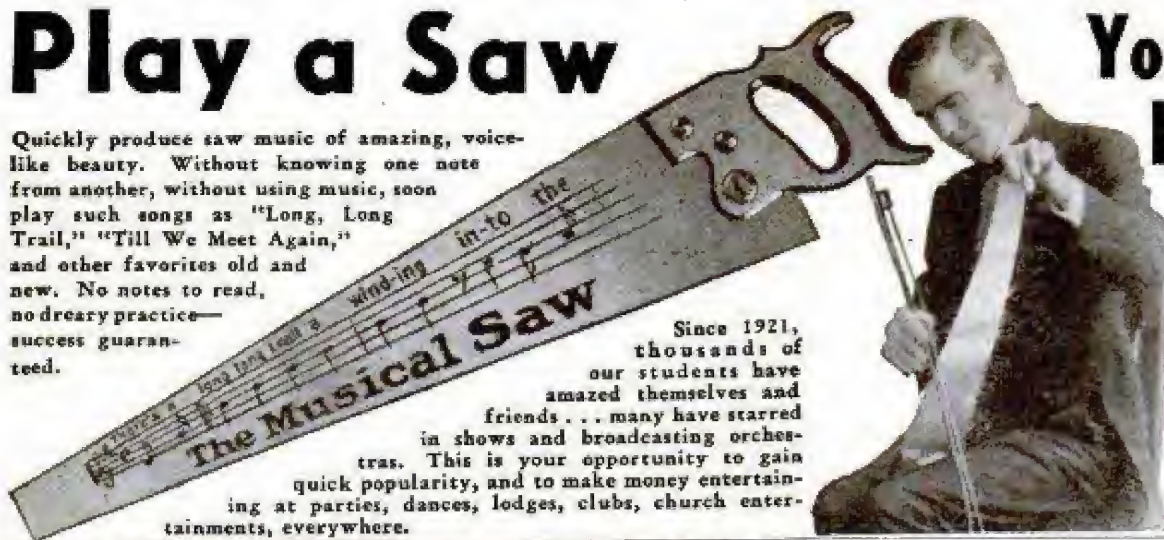
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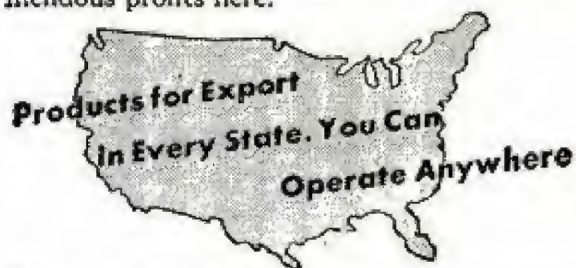
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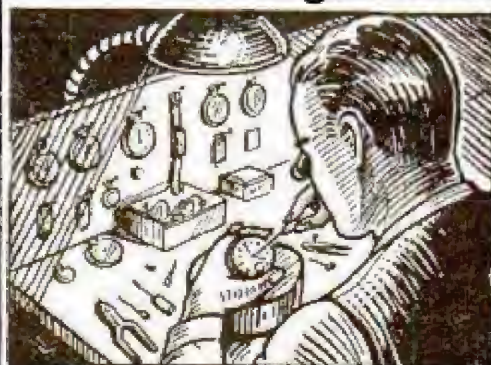
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BUILD Your own trailer! Save money! Have every feature you want! Plans for house, sport, camp and utility trailers. Catalog describing 9 models 10c. 15c in Canada and overseas. Jim Dandy, Box 125-A, Wausau, Wisconsin.

MODERN 30 Foot trailercoach. Designed for building in average garage. Blueprints, assembly instructions \$2.00. Simpson Trailers, Box 7789, Essex, Md.

NEW Book "Modern Trailer Coach" How to design and build trailers to 30 ft. \$4.00. New circular illustrating ten designs 20c. Craftsmann Books, Box 1153, Milwaukee, Wisconsin.

ELECTRIC Refrigerator kits. Make your trailer icebox into an electric refrigerator. Time tested machines. Simple and rugged. Detailed directions for installing and servicing. Write B-L-M Electric Co., 812 D St., San Bernardino, Calif.

ATTENTION Trailer builders: Ready to roll house trailer assemblies—all steel frame, tor-Q-les axle, bulldog hitch and jack, U. S. Royal tires. Complete information on request. Wausau Trailer Co., Box 351, Wausau, Wisconsin.

END Your travel worries and cares—"Home of a Thousand Addresses." Build it yourself. It features complete house-keeping facilities and will sleep four comfortably. Inside dimensions are 7' 6" x 17' x 6' 4". Any car will tow it. All-steel chassis and rugged framework permit it to roll along safely on the roughest roads. Send \$1.50 for complete set of blueprints and material lists. Popular Mechanics, Room 604, 200 E. Ontario St., Chicago 11, Ill.

MOTORCYCLES, BICYCLES, MOTORSCOOTERS AND SUPPLIES

CUSTOM Motorcycle accessories. Picture folder free! New seat covers, all colors, molded cushions. Chrome muffler-loudspeaker. Finest leather jackets; side-stand; seat springs, etc. Pacific Cycles, Dept. A4, 1208 Pine, Seattle, Wash.

SCHWINN Bicycles. All sizes. Wholesale. Retail. Send dime for list. Century Cycle, 3447 Lawrence, Chicago 25, Ill.

CLOSING Out sale, 400x7 4-ply tire, tube and wheel complete with Timken bearings. 7/16" axle, 7" hub length, \$8.95 plus 5% Fed. excise tax. Only \$7 available at this price. American Moto-Scoot Co., 630 W. Lake St., Chicago, Ill.

NOW Available for all 1945-46-47 American Moto-Scoots. Bendix lighting system—generator, sealed beam headlight with attachments. Give model when ordering. Genuine Moto-Scoot parts also in stock. American Moto-Scoot Co., 630 W. Lake St., Chicago 6, Ill.

MOTORCYCLE News—Monthly. Latest worldwide information. Yearly subscription \$1.00. Sample 10c. Motorcycle News, 5424-A Sawyer, Chicago 25.

BICYCLE Supplies, wholesale, retail. List, 10c. Universal, 4713 Virginia, St. Louis, Missouri.

CHROME Plating on all motorcycle parts. Doll up your bike. Free literature. Master Silverplaters, 2033 Caniff, Detroit 12, Michigan.

MOTORCYCLE Cams ground for speed and power. Write Harold Schaller, Box 31, Turlock, Calif.

SLIGHTLY Used American moto-scoots with Briggs and Stratton engine in excellent condition. T. Bullock, 4864 N. Magnolia, Chicago 40, Ill.

INDIAN And Harley parts catalog 16c. Pistons, motor parts, batteries, tires, chrome accessories. Bootz, 622 East Grand, Des Moines 9, Iowa.

MIDGET Automobile \$15, Cushman motorscooter \$20, Indian motorcycle \$30, tires 75c. Send 25c for Spring catalog #940 listing sensational bargains in motorscooters, servicycles, midget cars, used motors, parts. Associated, Box CS-1764, Toledo, Ohio.

EXPERT Rebuilding of racing and stock motorcycle engines. Largest stock of parts and accessories in middle west. Write for details. Bernardi Cycle Co., 1214 Jackson Blvd., Chicago 7, Illinois.

HARLEY-DAVIDSON Supplies, parts, accessories, oil service, tires all sizes, repaired 45" motors. Send \$2.25 for Army Motorcycle Manual, 10c for bulletin, Knuth's (Harley-Davidson Dealers), 2491 Fondulac, Milwaukee, Wis.

MIDGET Racer \$40, Cushman motorscooter \$15, motorbike outfit \$15, Harley-Davidson motorcycle \$35. Send 25c for new catalog #12 listing amazing bargains in motorscooters, motorbikes, midget cars, motors, parts. Gail, 538 Erie, Toledo, Ohio.

HARLEY-DAVIDSON Parts, accessories, batteries, and tires. 24 hour service. Authorized factory dealer, Philadelphia Harley-Davidson Company, 857 North Broad Street, Philadelphia 23, Penna.

WHEELS! Build wagons, scooters, mowers, trailers, wheelbarrows, grocery carts, baby carts, play pens, baby carriages, 4" to 16". Free list. Trulsen Mfg. Co., 811 E. 31, Kansas City, Mo.

TIRES And industrial wheels, suitable for scooters, wheelbarrows, farm equipment, etc. All sizes. Bicycles and accessories. Largest assortment in America. Send dime for list. Cycle Transport Company, 1241 So. Michigan Ave., Chicago 5, Illinois.

BUILD America's lowest priced motor-scooter speedster! Complete plans, specifications, \$1.00. Big list bargain priced used motors, etc., included free! Motor Supply, Box 1882-CS, Toledo, Ohio.

ENGLISH Magazines: Yearly rates Bicycle weekly \$4.50, Cycling weekly \$4.50, Motor Cycle weekly \$5.50, Motor Cycling weekly \$5.50. The International News Company, 131 Varick St., New York 13, N. Y.

CHROME Dual pipes for Harley Big Twins \$24.50 complete. Von Esser's, 2840 North Kedzie, Chicago 18, Illinois.

SCHWINN Bicycles, new and slightly used. Send dime for pictures. Atlas, 3002 Broadway, Chicago 14, Illinois.

MOTOR Scooters, bicycle engines. 120 miles gallon. Dime for catalog. Clymer, Dept. A-35, 2125 W. Pico, Los Angeles 6, Calif.

FLAT Rate Repair Manual for Harley-Davidson. Gives flat rate charge for every operation. Every dealer, owner, mechanic needs this new book. \$2.00 postpaid. Clymer, Dept. A-FR, 2125 W. Pico, Los Angeles 6, Calif.

T. T. Racing. New exciting, accurate book of world famous English road racing history. Just printed, \$3.00 postpaid. See our advertisements under autos. Clymer, Dept. TT-1, 2125 W. Pico, Los Angeles 6, Calif.

MOTORCYCLISTS Chromium accessories. New and reconditioned motors. Complete stock Indian parts. Expert motor rebuilding. Indian Motorcycle Sales, Kansas City 1, Missouri.

BICYCLES, Tricycles, parts, accessories. Send 10c for bulletin. Propp's, 2202 Fondulac, Milwaukee, Wis.

CUSTER Car \$25, Ner-A-Car \$35, other midget cars as low as \$12; motorscooters \$10 up; Briggs Stratton engines \$3 up; motorbike conversion \$5; Whizzers \$30 up. Over 5000 tires \$1 up. Mailorder only. Send 25c for Big War-Bargain Catalogue No. 24, just out, listing the above and almost 400 other bargains in new and used motors, motorscooters, midget racers, parts, plans, etc. (35c by first class mail.) Midget Motors Directory, Athens, Ohio.

MOTORCYCLE Pistons and parts, new, used. Harley, Indian, Henderson, Super-X, List 10c. Ballak, 811 N. 9th, St. Louis 1, Mo.

AVIATION

AVIATION Quiz Book, (by Zweng) two books in one—Prepares for private and commercial rating; contains new examinations not available elsewhere. Only \$3.00 postpaid; also Mechanics Manual \$3.00. Pan-American Navigation Service, 12021-C Ventura Blvd., N. Hollywood, Calif.

GIANT Kites, Only \$20. Fraction government's cost. 10x14 ft. double tier. This monster tows cars, skiers, skaters, canoes. Lifts light persons, antennas, advertising, cameras. Pleasure. Profit. Great-Northern Mart, North Adams, Mass.

AIRFORCE Sextants, marine or air navigation, Fairchild \$12.50; Bausch-Lomb \$29.75. Aerial cameras \$175; Elgin stop watches \$12.75. (Free bulletin.) Pan American Navigation Service, 12021-C Ventura Blvd., N. Hollywood, Calif.

PROPELLERS—2 And 3 blade for snow-ice sleds, boats. Catalog. Standard Aircraft, Box 387, Ft. Worth, Texas.

VETERANS: Flight training under the G. I. Bill. Tuition paid. Private, commercial, flight instruction, instrument and multi-engine ratings. Opportunities to work for living expenses or tuition, if not a veteran. Write Goitschalk School of Aeronautics, Adrian, Mich.

STERLING Identification bracelets with wing. Every AAF pilot had one. Were \$10.00. Clearance \$4.45. VanDusen Aircraft, Minneapolis, Minnesota.

JET Propulsion experiments. New design. Drive bicycle. Circular on plans. Rush name. Maupin, Tipp City 7, Ohio.

AVIATION "Quiz System" famous "Zweng" books with authentic "Multiple Choice Examinations" include: Flight instructor \$3.00; private and commercial (two books in one) \$3.00; A & E mechanic \$3.00; flight engineer \$4.00; Our "war surplus" releases include: Airforce Fairchild sextants \$12.50; Bausch-Lomb \$29.75; aerial cameras \$175.00; Elgin stop watches \$7.50; Astro Compasses (good) \$8.75, new \$12.50. (Free folder.) Pan American Navigation Service, 12021-C Ventura Blvd., N. Hollywood, Calif.

ELECTRICAL SUPPLIES

D.C. Meters, new, 3 1/2". \$1.39 each. 5 for \$5.00, send for list B2. Boutwell Electric, 203 Gilbert, Kirkwood 22, Mo.

LAMPS—Build own originals, parts wholesale any amounts. Catalogue 10c. Brown Lamp Co., Box 501, Wellston, St. Louis 12, Mo.

CAPSULE Thermostats—40 watt capacity, high voltage, opens circuit on temperature rise. 3 for \$1.00. D. E. Kitchen, Logan, Ohio.

ELECTRIC Heater—Wonderful value—Regular \$12.95, only \$6.95 delivered. Underwriter's approved. 1225 watts, 115 volts. Vogt Mfg. Co., Box 1122, Louisville, Kentucky.

ELECTRIC Pencil—Writes, engraves all metals, 110 volts, complete \$2.95 or two for \$5.00. Battery model \$1.00. Reb Industries, Dept. 265-DG, Elmhurst, Illinois.

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LAMPS—If you build or repair and have trouble finding parts—your search is ended! We carry practically every part necessary. Harps, fittals, vase caps, etc. Illustrated catalog 10c. Gyro Lamps, 5416P Clark, Chicago 40.

TATTOOING Machines, outfits. Free catalogue. Jensen, 120 West 83rd Street, Los Angeles 3.

FREE Catalog—Motors, welders, welding supplies, generators, fencers, electric mowers, freezers, other electrical items. LeJay Company, Minneapolis, Minn.

ALNICO Magnets, free list. Terry Sales Company, 3726 South Detroit Avenue, Toledo 9, Ohio.

AMAZING Communication unit! Remote controlled to send messages house to barn, to shop, etc. Communicate with dad in garage or junior in attic. Contains two identical set-ups with buzzers, lights, remote control transformers and dial with codes. Operates on regular house current, ready to operate, simple to connect. Unlimited uses. Only \$14.95; three sets for \$40. "Amazing Bachman's," 25 Herman Street, Rochester 5, N. Y.

MAKE Electric welder, also pencil. Information free. Write "International," 6347 Parnell-X2, Chicago 21, Illinois.

ELECTROPLATING Has a thousand and one uses when working with electrical supplies and equipment. Warner Electroplaters permit you to easily plate chromium, gold, silver, nickel, copper, etc. Plating equals costly commercial jobs. Pay for your electroplater in a short time by plating for others at a profit. Write today for free sample and literature. Warner Electric Co., Dept. ES-3, 1512 Jarvis Avenue, Chicago 26, Ill.

GUNNERS Training table. New—the greatest value offered yet. Ideal for clubs, shooting galleries, automatic checking, counting, burglar alarms. Can be operated as a very profitable business. Comes complete with 7 a.c. 110 volt motors, sensitive electric eye, powerful amplifier, rotating mechanism; maple top table, etc. All parts can be used individually. Worth the investment for parts and mechanism alone. Limited time; \$300. "Amazing Bachman's," 25 Herman Street, Rochester 5, N. Y.

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WELDERS!—New portable Champion special transformer welder; 110/120 volts, a.c. 3 heat stages. Welds, brazes, solders, cuts all metals. Complete with electrode holder, helmet, rods, carbons, fluxes, cables. Also special flame weld torch. Easy to use. Full directions. Splendid for shop, farm and home repairs. Guaranteed. Only \$27.50. Money back guarantee. Also resistor model, now \$14.95. Magic Welder Co., 239 MP Canal St., New York, N. Y.

"BUILD-UP-OWN" Portable arc welder. Save \$300. Easy with Hobart generator plus auto engine. Free instruction book. Write Hobart Welders, Box M-383, Troy, Ohio.

BUY Direct from factory. Welding outfit \$48.36. Soldering outfits \$7.76 to \$10.16 complete prepaid. Box 331, Hamilton, Ohio.

AIRPLANE Wheels complete assembly with tires as used on plane. Department One B, Post Office Box 89, Merced, California.

WELDING Supplies—Electric and gas. 1/16" rod 15c doz., 3/32" 25c doz., 1/8" 30c doz. Carbons 1 1/2" 15c ea., 3/8" 25c ea. Welders gauntlet gloves \$1.95 pr. 110 volt welder complete \$17.85. New govt. surplus helmets with 3 lenses. \$3.85 ea. Gas welding outfit, complete \$57.00. Complete stock welders clothing. Sweeney, 7241 S. Halsted, Chicago 21, Ill.

OXY-ACETYLENE Welding outfit including: Full oxygen and acetylene cylinders. \$72.95 complete, f.o.b. Cleveland, Ohio. New, supply limited. Check or deposit with order, balance c.o.d. Cylinders can be refilled anywhere. Ideal for hobbyists, garages, repair shops, etc., includes supply of rod. The Burdett Oxy-Weld Equip. Co., 3399 Lakeside Avenue, Cleveland 14, Ohio.

OXY-ACETYLENE Welding and cutting outfit complete with cylinders and carrying case. Designed especially for hobby-shops, small repair shops, refrigeration and electrical service men. You own the cylinders. Free literature. A-A Welding Supply Co., C9228 S. Ada St., Chicago 20, Ill.

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ELECTROPLATING Has a thousand and one uses. Warner Electroplaters permit you to easily plate chromium, gold, silver, nickel, copper, etc. Plating equals costly commercial jobs. Pay for your electroplater in a short time by plating for others at a profit. Write today for free sample and literature. Warner Electric Co., Dept. WS-3, 1512 Jarvis Avenue, Chicago 26, Ill.

ACETYLENE Welding outfits, complete, brand new, \$45.00. Eagle Welding, Dept. PM, 5085 Broadway, Chicago 40.

WELDERS—Govt. surplus tested gasoline driven. Save up to 50%. Iowa Machinery Co., Des Moines.

HEAVY-DUTY, 110/220V. a.c. arc welders. R.E.A. approved outfits. Williams Sales, Box 4100, Portland 8, Oregon.

PREHEAT Guns and generators. Preheating for welding, annealing. Gun complete \$39.50, burns natural gas. Generator \$59.50, uses gasoline. Write Goodwin Mfg. Co., Crab Orchard, Ky.

A.C. Welders, 110 v. welds 1/2" steel, \$29. Morris Welding Service, 1850A State St., Schenectady 4, N. Y.

MACHINERY, TOOLS, SUPPLIES

MICRO Switches, three different, \$2.75. Aircraft switches, fine assortment, \$2.25. Self-oiling bushings, four lb. assortment, \$4.00. Aluminum spacers, 5 lb. assortment, \$2.00. Aluminum rivets, 4 lb. assortment, \$1.50. Columbia Salvage Co., 173-3rd Ave. No., Nashville 3, Tenn.

CHUCK S. Independent, Universal, threaded 1 1/2"-8 for South Bend, Atlas, Logan, Clausing, Craftsman lathes. Top value. Free literature. Westcott Chuck Co., 3009 Walnut, Oneida, N. Y.

WAR Surplus special: Big 50 lb. box popular size bolts, nuts, washers, screws, clamps, etc. \$6.85. War Surplus Co., Box 910, New Brunswick, N. J.

GRINDERS, Drills, vises, clamps, punches, taps, dies, tool boxes, micrometers, indicators. Catalog 10c, refunded. Precision Tool Service, Dept. M, 55 E. Washington, Chicago 2, Illinois.

LATHES, Saws, grinders, sanders, hand tools. Bottom prices. Kalder Engineering, Grand Rapids 6, Michigan.

WAR Surplus in small tools for machine shop. Send 15c for bulletin. Travers Tool Co., Dept. P, 5 Court Square, Long Island City, 1, N. Y.

LATHE Boring and threading done fast and accurate with America's newest low priced bar holder. Free literature. Miles Products, 2532 Wabash, Chicago 16, Ill.

ELECTRIC Motors, all sizes, also fan parts, build your own. Universal Fan Co., Peru, Indiana.

HOME Lathe owners—Build your own attachments. Send for picture, sample of work and list of blueprints. Cut gears, ratchets, etc. Make neat screws easy way. The Home Shop, 415 Raymond Ave., Glendale 1, Calif.

FOOT Switch—Operates all power tools. Guaranteed. \$3.95 or two for \$6.50. Reb Industries, Dept. 265-DF, Elmhurst, Illinois.

MECHANICS, Hobbyists—New war surplus bargains. Dual-drive assembly, geared 7 to 1 reduction, driven by powerful 1/5 h.p. a.c. or d.c. motor, operates on 6-27 or 110 volts with transformer. Simple attachments adapt this unit to countless uses. Used as individual drill, sander, etc. by detaching flexible drive shaft. Complete with stepdown transformer, worth half the investment; which can be used to convert nearly all aircraft motors to regular house current. \$300 value! Special! \$19.50. All new flexible drive cables, 10", 25" or 72". Combination three sizes, \$1.75. Precision-built right angle drives, complete with flexible drive cables, \$3.50. Magnet wire, 1/2 lb. coils No. 23, 10 rolls for \$3.00. 27 volt geared head (120 r.p.m.) motor, \$30.00 value; special \$2.95. New aluminum and steel bushings and spacers, variety assortment, 5 lbs. minimum, \$4.75. Rivet assortment; copper, steel, aluminum, over 250 varieties. Extra special, 5 pound minimum \$4.75. Micro switches, 6 variety assortment, only \$4.75. Ranger engine, new, in original case, 570 h.p., 12 cyl. V type. Engine Spec. No. 177. Complete with spark plugs. Original cost over \$12,000 each. Special, \$200. Crated weight 1200 lbs. Selsyns; new! Transformers; GE Model 2J1G1, 57.5-57.5V 400 cy.; Generators GE Model 2J1F1, 115-57.5V 400 cy. With gears, \$1.50 each. Quantity lots, \$15.00 dozen. Ampidyne motor-generators; GE-5AM 31N3A. Output 60 v.d.c. input 27 v.d.c., 530 watts \$120 value, now \$6.95 each, three for \$20. Dynamotors; 400 cycle, GESD21N3A, 27 v.d.c. to 100 v.a.c. 485 watts. Sensational offer, \$7.00 each, three for \$20. Order today! No c.o.d. "Amazing Bachman's," 23 Herman Street, Rochester 5, New York.

V-BLOCKS At low prices, new type with clamps, rust-proof, home or factory. Write Miles Products, 2532 Wabash, Chicago 16.

REGULAR \$4.25 Set. Six open end wrenches. Forged. Cadmium plated. Not surplus. Only \$2.95. Sizes 3/8 inch to 1 inch. 26 North 11th Street, Toledo, Ohio.

DRILL Grinder for twist drills \$2.95. See ad on page 250.

MACHINE Plans catalog 25c. Vanburgh, 157 State, New Haven, Conn.

CASTINGS. Blueprints, materials for woodworking and metalworking machine tools. Suitable for commercial or home shop production. 23 items, catalog 10c. Lewis Machine Tool Co., 3217 Union Pacific Avenue, Dept. M, Los Angeles 23, California.

A.C. Arc-welders, bench sanders, power mowers. Bargains. Holgerson's Service, Canton, Kansas.

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YOUR Drill press a lathe! Write Edwards' Specialties, Box 687B, Alhambra, Calif.

METALWORKING Saws, end mills 25c. Circular 10c. Machinery, Newfane 2, Vermont.

HARDWARE. Tools, pattern supplies, castings, electrical equipment, belts, pulleys, drills, brass, steel, drill rod. Catalog 5c. Terek, 6304 Patterson, Chicago 34.

CONVERT Your electric hand saw into a portable belt sander, only \$39.95. Write for details. A & P Equipment Company, 2337 American Ave., Long Beach, Calif.

ASSORTED Scissor screws, free list. Overland Saw Service, Independence, Iowa.

ELECTROPLATING Has a thousand and one uses when working with machinery, tools and supplies. Warner Electroplaters permit you to easily plate chromium, gold, silver, nickel, copper, etc. Plating equals costly commercial jobs. Pay for your electroplater in a short time by plating for others at a profit. Write today for free sample and literature. Warner Electric Co., Dept. MT-3, 1512 Jarvis Avenue, Chicago 26, Ill.

ANGLE Surface and sine plates. Free literature. Mathis Machine Corp., South Bend, Indiana.

TAPS, Dies, tools and supplies. Buy direct by mail. Free catalog. King Tap & Tool Co., North Attleboro, Mass.

AIR Compressors. Dealers wanted to introduce the new Belco line for service stations, garages, shops and paint spraying. For particulars, write Belco, 619 North Broadway, Oklahoma City, Oklahoma.

BALL Bearings one-fourth list price. Free list. Burgess, Box 168, Ferguson, Mo.

MODERATELY Priced. Available now. Portable electric sander, woodworking power tools, shaper, bandsaw, etc. Paint sprayers, Armand grinder for schools, home work-shops, cabinet-makers, farmers, garages, repair shops, others. Postcard brings free bulletin. H. Saltzman Co., 118-14 33rd Ave., Kew Gardens 15, N. Y. Dept. S.

SHEBEL Saw filer. Files all saws. Circular. A. P. Shebel, 730 B. So. 2nd St., Milwaukee 4, Wis.

DRILLS—Taps reconditioned, up to seventy-five percent off list. Send for free circular just published. Perry Screw and Bolt Corporation, 4250 Grand River, Detroit 8, Michigan.

CONCRETE Block machines \$39.50 up. Catalog free. Concrete Machine Company, 5466 Gravois, St. Louis 10, Missouri.

DRILL Grinder—Grinds drills to factory accuracy. Calipers with direct reading scales. Circle cutters. New Tool grinder. Lowest prices. Free literature. Factory, 811-B East 31st, Kansas City 3, Mo.

ENGINES, MOTORS, DYNAMOS

GAS Drive arc welders. "Build your own." Portable, goes everywhere after profitable jobs. Free instruction book. Write Hobart Welders, Box M-384, Troy, Ohio.

INVALUABLE Collection of diagrams and instructions for motor winders. Jednak, 107 Island Ave., McKees Rocks, Penna.

WINDING Data, listing 225 motors, single and three phase, \$1.00. Motor Data Co., Box 7631, Kansas City 3, Mo.

BARGAINS In war surplus hydraulic transmissions, switches, motors, geared reducers, aviation instruments, etc. Delta Sales, P. O. Box 968, Shreveport, Louisiana.

ARMATURE Winders. send for bulletins on motor winding tester and a.c. motor winder. Motor Industries, Quincy, Illinois.

MOTORS! 1/2 h.p. d.c. converted to a.c. All new, High speed 110 volt, 25 or 60 cycle, single phase, ball bearing motors. Actual value about \$75.00. Now \$15.00 each or 3 for \$40.00. Can be used in any position. Immediate delivery! No c.o.d. "Amazing Bachman's," 27 Herman St., Rochester 5, N. Y.

1/2 H.P. Rebuilt 110 volt repulsion induction motors \$21.50. List 10c. Larger sizes, new motors. A. C. Motors, 3101 N. 32nd St., Philadelphia 32, Penna.

WELDING Generator, 150 ampere \$47.50. 1/2 horse 1725 r.p.m. a.c. motor, \$24.50. Butler, 1885 Milwaukee, Chicago, Ill.

SIMPLEX Duplex rotary water motors. Adapted to air or steam pressures, 125 lbs. or less. Sizes 1/2 to 1 h.p. Larger sizes to order. March specials while they last. No. 30-A (3") 1/2 h.p., \$5.00; No. 40-A (4") 1/2 h.p., \$7.50; No. 60-A (6") 1/2 h.p., \$12.50; No. 80-A (8") 1 h.p., \$16.50. Also double driven vertical or horizontal duplex motors, 1/2 to 3 h.p. Duplex Motors, Burlington, Iowa.

BOATS, OUTBOARD MOTORS

BOAT Building plans: Runabouts, cruisers, sail boats, Wood, plywood, and welded steel construction. Illustrated book, "Modern Designs For Boats And Yachts" \$1.00. John B. Clark, Yacht Designer, 329 Kenmore Drive, Bay Village, Ohio.

BUILD—10' plywood boat. Complete plans and building illustrations \$1.00. Lockhaven Marina, 3036 Commodore Way, Seattle 99, Washington.

ATTENTION Sportsmen! Assemble kayak from easy-construction kit. Complete! Nothing additional needed. Play-yacks, Dedham, Mass.

P-38 BELLY Tank speed boat. Complete plans, instructions \$1.00. Twintank Boat Company, 1032 62nd St., Oakland, Calif.

BOAT Steer wheels, windshield brackets \$8.95. Modern hardware kits, bargains galore, folder, Marine, Box 681, Mendota, Minnesota.

BUILD Your own boat by the Welch System with knock down kits. Save 1/2 cost. Rowboats to cruisers. Illustrated catalog 25c. Midwest Boat Company, Menomonee Falls, Wisconsin.

SIGNALLING Light — New — Gov't surplus. An exceptional value for boats, construction work, scouting, etc. Powerful light with three filters and case. At a fraction of cost. Operates on 27 volts or 110 volts with transformer. While they last, \$7.95, three for \$20. "Amazing Bachman's," 25 Herman Street, Rochester 5, New York.

CATALOG: Sixty best designs, full size patterns, blue prints — outboard, sail, power; with book "Boat Building" \$1.00. Marine Mart, Buffalo 7b, N. Y.

AIRPLANE Jettison tanks — Streamlined, 10 1/2 foot, tear drop shaped, 165 gallon. Of light weight lead coated steel, weighs 75 pounds. Floats over 1200 pounds. Ideal for making trim, inexpensive boats, canoes, kayaks, dinghies, duck boats, powered catamarans and runabouts. Prices \$12.50, \$9.75 each for three or more, U. S. freight prepaid. General Sales, 205 Market, Grand Rapids 3, Michigan.

BUILD A boat with knock down kits. Simple and enjoyable. Outboards, inboards, sail and racing. Send dime for literature. Brooks Boat Company, Dept. PM, Carrollton, Michigan.

13' OUTBOARD Utility high performance 15-20 m.p.h. with 6 h.p. Learn boat construction, follow simple economical detailed plans, stem and rib outline full scale, \$10.00. Steinau, 109 Elk Ave., New Rochelle, New York.

BUILD Your boat from paper patterns, forty years careful designing. Send 10c for folders. Latest manual, small boat construction \$1.50 postpaid. Germain Boat Company, Dept. 3, Saginaw, W.S., Michigan.

MARINE Catalogue—15,000 deliverable items; pictured \$1.00. Marine Mart, Buffalo 7b, N. Y.

MARINE Power—Easily convert any Jeep or Ford motor (domestic or foreign) with Convo parts and kits. Complete catalog 25c (coin). Osco Motors Corporation, 2020B East Orleans Street, Philadelphia 34, Penna.

PACKAGED Boats—Complete moulded and sheet plywood kits; \$39.50 up. All sizes. Literature 25c. Marine Mart, Buffalo 7b, N. Y.

OUTBOARD Motors—Good values, used motors. Also used parts for most makes and models. Crandall-Hicks Co., 911 Commonwealth, Boston, Mass.

P-38 BELLY Tanks, new, steel, 10 ft 2 in, 165 gallon \$9.95. Anzio Boat Co., Box 89H, Merced, Calif.

BARGAIN \$20. Make your own boat now with readymade streamlined laminated one piece hull as developed for Navy. Light, sturdy, leakproof. Anyone can convert into dinghy, outboard scooter, cartopper, other craft, 9'x4'. Write Warwood, 480 Lexington, New York 17.

BELLY Tanks—75 gallon, new, steel, 8 ft. 4 in. \$7.50. Anzio Boat Co., Box 89H, Merced, Calif.

NEW, Used, rebuilt marine motors. Marine conversions, fittings. Free catalog. Stokes Marine Supply, Dept. 24, Coldwater, Michigan.

ALL Copper water jacketed exhaust manifolds for marine conversions of automobile and aviation engines and marine engine replacements; any make, model or age. Joseph Van Blerck & Son, 391 Woodcleft Ave., Freeport, N. Y.

BOAT'S And all about them. How to select, build, repair and operate. For 40 years the leading practical boating magazine. Half price trial subscription, 12 issues for \$1.00. Motor Boat, 62 Gold Street, New York 7.

BOAT Designers are highly paid professionals. Complete course by mail. Catalog. Westlawn, Montville, N. J.

ATHLETIC EQUIPMENT, BODY BUILDING COURSES

BARBELLS. Exercise equipment. Courses. Free booklet. Good Barbell Co., Reading, Penna.

SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY, TRAPPING

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SPECIALTY Manufacturing, the big money business that can be operated anywhere, start on a very small capital; we supply dependable formulas and complete instructions; get interesting free booklet, "Money-making Opportunities in Specialty Manufacturing." Howard Robinson, Ph.G., 1390-A South Ohio Street, Sedalia, Mo.

425 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

137 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 220 Grand St., New York 13.

BRUSH Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H. Decatur, Ill.

GET It for them wholesale. Be community buyer nationally-known merchandise; radios, refrigerators, washers, sweepers, typewriters, etc. Savings up to 50%. This pleasant, easy work can earn up to \$5000 year. Get details today. Kraft, Aurora 8, Missouri.

WHITE Liquid rubber for making flexible molds! Quick drying! Safe! For home, classroom, or industry! Quart \$3.00. Gallon \$5.95. Full instructions! Beginner's booklet on molding and plaster casting 25c. Free with order! Plastercraft Supply Company, 1406 East 43rd Street, Cleveland 3, Ohio.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Odd, Successful Enterprises" (free! Some offer occasional "day off." Work home. Expect something odd! Pacific, Oceanside, Calif.

MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordon Publishers, Box 23, Pawtucket, R. I.

CO-PUBLISH And advertise in The Central Mail Advertiser. Sample copy for stamp. Low rates. Large circulation. Bagby Printing Co., Georgetown, Ohio.

HOW To set up and run a mirror shop! Resilver mirrors. For price write—John Sprinkle V80, Marion, Indiana.

MAIL Order opportunities. Full or spare time. Hundreds of chances. No charge. Postal brings copy. Blackstone Press, Somerville, New Jersey.

MONEYMAKING OPPORTUNITIES

MEXICAN Feather Bird pictures direct from importer. No import duties to pay. Sample 25c. Importer C. Staff, 14960 Evanston, Detroit 24, Michigan.

RADIOMEN—Laugh at layoffs. Make big money. Become independent. We show you how. Write: Merit, 216-32D 132nd Avenue, Springfield Gardens 13, New York.

READ "The Hamster Manual." Learn everything about the new money-making wonder animals from Syria. Tells where to buy and sell these delightful animals. Beautifully illustrated. Copy, \$1.00. Albert Marsh, 1518 Basil, Mobile, Ala.

SEWING Machine repairmen make big money lifetime. Start neighborhood shop. Complete repair manual, covering all makes. \$1.98 postpaid. Money back guarantee. Sewmachine Serviceman, Hamilton 9-L, Ohio.

THOUSANDS Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 40, Illinois.

MANUFACTURING Costs 9c; finished article \$1. Tremendous demand. Gelloid, Box 6353, Cleveland, Ohio.

EXTRA Money? Free details. Trable, 1018 1/2 Elm Street, Dallas, Texas.

SIX (Different) leading mailorder magazines, 25c. American Directory, Calallen, Texas.

JOIN Money-makers Club. Many mail order and home work plans. Six months service 10c. Lewis Service, 828-M Carpenter, Oak Park, Ill.

"WHOLESALE Buyers Guide" (copyrighted), articles wholesale, 32 pages. Dept. B. Snook Specialties, 188 N. 21 St., Battle Creek, Mich.

MONEYMAKER, 40% Profit selling metallized baby shoes. Beautiful sample shoe, circular, information, \$3.00. C. Buchanan, Suite 2, 16 Lisle Ave., Binghamton, N. Y.

FREE Samples imprint circulars offering nationally advertised merchandise by mail. Danbros Watch Company, 3530 Hanover, Baltimore 25, Maryland.

PAINT Signs and show cards. Profitable business. All information, instructions \$1.00, postpaid. Monroe Products, 270 Lexington Ave., Rochester 13, N. Y.

WHETHER You're first contemplating or presently in a mail order business. You must read "How To Make The Mail Order Business Pay." A guide to sound profitable mail merchandising. Only 25c prepaid, satisfaction guaranteed or money refunded. Biga Mailway Sales, 4903 W. Cullom Ave., Chicago 41, Illinois.

WINDSHIELD Wiper rebuilding brings big profits. Free particulars. H & H Products, Box 430, East Akron 5, Ohio.

EARN \$10.00 Every hour. Sell "Everlast." Inquire Stampico, Detroit 4, Michigan.

WHOLESALE Catalog. (Illustrated, 10c). Bargains galore. Stafford, Box 5211, Indianapolis 1, Ind.

EARN Up to \$520 month part or full time keeping books for small firms. Simplified system. Write Tax-Saver System, Dept. D, Ft. Worth, Texas.

SPRAY Velvet covering on lamps, jewelry, etc. Outfit, instructions \$2.95. Y-Sparks, 1145 Queen Ann, Los Angeles 6.

MONEY Making secrets exposed. How to achieve beauty and keep charm. Write for details. L. Saulsberry's Book Agency, 3055 Waco Street, Shreveport, La.

GET Dollar orders by mail. You keep 90c profit! Easy, pleasant, home business. Few dollars starts you off. Begin now. Complete details, free. Hurry! Herriott, Box 953, San Antonio, Texas.

INCREASE Your earnings! Local business opportunities; mail order information; wholesale supply sources; valuable money-making tips; information. Free details, rush name! Wilkin Company, Hillsboro, Ohio.

I CAN Show you how to start a paper-hanging or decorative business, full or part time. Modernistic Decorating Co., 1021 Prospect Ave., Toledo, Ohio.

MAKE Steady income with alarm clocks. Free booklet. Thies, Genoa 3, Illinois.

MAKE Perfume. Profitable, sparetime home business. Men, women, write "International," 6347 Parnell-X5, Chicago 21, Illinois.

FREE Literature describing fifty proven successful, home-operated mail order plans. Reiss, 3017-P Ocean Parkway, Brooklyn 24, New York.

MAKE Manila door mats. Particulars free, or instructions and equipment complete \$5.00. R. E. Wade, Parkville 2, Three Rivers, Mich.

BIGGEST 25c Value ever offered! Three big issues "Opportunities Preferred," greatest business building magazine ever published; plus big dollar copy of idea "Reference Directory" book; \$1.75 value, only 25c! Order yours today. Hurry! Coates, Publisher, Box 98-F, Dorchester, Mass.

MAKE Sell, concrete garden furniture. Easy, simple. We supply molds, instructions. Write Lehnert, Norwood, N. J.

BE The Popular Mechanics representative in your neighborhood and earn big profits in your spare time. Write Popular Mechanics Magazine, Room 408C, 200 E. Ontario St., Chicago 11.

START Your own business! Big money manufacturing novelties, plaques, statuary. Free catalog. Write Bing Products, 88-A-N Broad Street, Boston 10, Mass.

MAIL—Beginners. Look before you leap in 1948! Get big information guide to financial independence. Truly the greatest opportunity of the year! Send 15c to cover costs. Leese, 4718 North Laverne, Chicago 30, Ill.

ELECTROPLATING Has a thousand and one uses. Make good money in spare or full time. Warner Electroplaters permit you to easily plate chromium, gold, silver, nickel, copper, etc. Plating equals costly commercial jobs. Pay for your electroplater in a short time by plating for others at a profit. Write today for free sample and literature. Warner Electric Co., Dept. MO-3, 1512 Jarvis Avenue, Chicago 26, Ill.

ANYONE, Anywhere, anytime, can operate this proven mail-order method. Free details. Eugene Kall, 1209 Highland, Dubuque, Iowa.

METALLIZE Baby shoes. Further information—3c stamp. Metal Crafts, Box 125-R5, Tampa 4, Florida.

MAKE—Sell new amazing auto paint you simply wipe on. Complete formula \$1.00. Ideal Service, Park Ridge 8, Ill.

UNPAINTED Plaster ornaments: Beautiful designs, easily decorated with water colors or oil paints. Profit or hobby. Illustrated list free. Distributors of new Loxite, a Firestone product, for molds. Midwest Novelty Mfgs., 108A Cedar, Anaconda, Montana.

PUBLISH Amusement Guide. Profitable local business. Details free. Ward Associates (J2C), Greendale, Wis.

\$400 MONTHLY Possible by mail. Small investment, free details. R & M Mailing Service, 203 First Avenue, Carbon Cliff, Ill.

START Your own mail order business. Free literature. Schmaltz, Box 335, Mar Vista, California.

WHOLESALE Anything imaginable. New guaranteed list 25c. Refundable. La-salle Novelties, Box 2188, Waterloo, Iowa.

RESILVER Mirrors at home. Formula 25c. Ideal Service, Park Ridge 6, Illinois.

EARN Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

WIN Contest money. General Contest Magazine gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609 1/2 East 5th, Duluth, Minn.

BIG Profits. Sensationally new. Every home, office, store prospective buyers. No competition. Exclusive dealerships. Sherwood Products, Erie, Penna.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

WOULD You pay 3¢—first \$350 made? Color-illustrated book "305 Odd Successful Enterprises" free! Proven! Work at home, office. Expect something odd! Pacific, Oceanside, Calif.

THERE'S Big money in junk, and repairing batteries. Write. Batteryman, Grand Junction 5, Colorado.

\$245.50 MAKING Unusual secret device without skill, machinery, from former war material costing \$1.50! Simple, baffling invention, unbelievably profitable! Illustrated proofs free. Rolls Enterprises, 115-D West 16th, New York 11.

FORTIFY The future! Start own business; home, office. Booklet describing "Collection of 137 Tested Plans" free. Elite Co., 320-A Grand St., New York 13.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord. Nebr.

FORMULAS, PLANS, ETC.

WANTED: 20,000 Progressive persons to spend the best 1948 50c they ever spent. Guaranteed or money back. Read "strictly." A "must." Containing over 35 valuable, new, special formulas, plans, money-making propositions, information. Don't wait. (No stamps.) Circular free. Teycer, Chemist, Box 1287 1/4, Chicago 90, Ill.

FORMULAS. Any purpose or process; auto polish, soaps, lacquers, perfumes. You name it we have it. Any three \$1.00. Hale, 1017 Edgewood Lane, Patience, N.J.

PRODUCTS Duplicated. Analyses. Commercial formulas. Consulting Scientific Company, Swarthmore, Pennsylvania.

MANUFACTURE Cleaners, soaps, polishes, flavors, cosmetics. Literature free. Kemico, Park Ridge 16, Illinois.

10,000 FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

PLASTICS

MOLDS Made to order. Send us your models by insured parcel post. Models returned unharmed. Work guaranteed. Apex Art Plastics, 2128 Marconi, St. Louis, Mo.

COLOR Plexiglas, 8 colors. Instructions, cameos, carscrows, pinback to make complete set two tone costume jewelry. \$1.00. Bradlee, P.O. Box 142, Buffalo 5, N. Y.

LUCITE. Plexiglas, masked sheets. All sizes. Cost square foot (12"x12") 1/16" 90c; 1/8" \$1.18; 3/16" \$1.43; 1/4" \$1.68; 5/16" \$2.09. Lucite rod, tubing. Include 10% postage. Almac Plastics, 230 Fifth Avenue, New York 1, N. Y.

LUCITE—Rods, sheets, tubing, fabricators, findings. Catalog dime. Book "General Plastics," \$1.50. Mid-West Plastic, 1717 No. 66, Omaha 4, Nebr.

SAMPLER—Contains casting resin, mold, supplies, instructions. Everything to mold several small salable articles \$2. Circular free. Artcrafters, 2917 Michigan, Kansas City, Mo.

LEARN Internal carving of plastics for pleasure and profit. It's easy, exciting to carve flowers, animals, landscapes of colorful, thrilling beauty in solid Plexiglas plaques and cubes. Send 10c for complete instruction folder, jewelry findings catalog and big plastics price list. Plastic Parts, Dept. H-2038, 1157 S. Kingshighway, St. Louis 10, Mo.

PLASTICS Trade secrets. Write for free information. Enclose 25c if you would like plastics samples. Plastics Research, Box 346, Alhambra, Calif.

RENEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723B Troost, Kansas City, Missouri.

10 ENTIRELY New ideas, plastic projects, \$1.00. Designers Group, Box 363, Pleasantville, New Jersey.

PLEXIGLAS—Masked sheets, 12"x12", 1/16"—\$1.00, 1/8"—\$1.25, 3/16"—\$1.55, 1/4"—\$1.85. Include 10% postage. Internal carvings. Drills, dyes. Luminous powders, rods, tubes, cements, jewelry findings. Free catalogue. Craft Plastics, Somerville, N. J.

PLASTIC Injection machines, Plexiglas, dyes, jewelry findings, kits, etc. Free catalogue. O. Baker Company, River Edge, New Jersey.

FABROS Pre-fabricated plastic kits and supplies. Sample kit 50c. Catalog free. Fabros, Box 156 Station F-1, Buffalo 12, New York.

FORMALIN for lustrous color-castings. Free literature. Complete line plastics casting supplies. Sample kit \$3.00 f.o.b. Formalin, Romeo, Michigan.

INTERNAL Carved swans, bluebirds, goldfish, butterflies, etc.; pins, \$1.50, 2 1/2"x2 1/2" paperweights, \$2.50; roses, costume jewelry sets, \$1.50 less findings; 2x2x2 paperweights, \$2.00. Crystal Floral Novelty Co., Somerville, New Jersey.

PLASTICS—Sheets, rods, tubes, all colors; dyes, supplies; findings. Illustrated fabricating manual, prices, 10c. Lucite sample, 35c. Gem-O'-Lite, Box 686F, North Hollywood, Calif.

PLASTIC—Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2618 St. Louis Ave., St. Louis 6, Mo.

CHEMISTRY

NEW Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 22, Illinois.

LEARN Chemistry at home, from the house of Winn. Home of supplies for student chemists. New idea chemical and apparatus outfits for home experimenting. Semi-professional microscopes and accessories. Send 10c for retail catalogue. Established 1931. John H. Winn, Dept. 503, 124 West 23 Street, New York 11, N. Y.

CHEMICALS And apparatus for industrial, analytical and private laboratories. Complete supply service for correspondence school students. Send 10c for catalog. Dept. M-43. Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, New York.

FREE Catalog: Chemistry, mineralogy, physics, biology, Tracey Laboratories, Evanston, Illinois.

CHEMICALS—LAB. Supplies. New catalog 10c. Mel-Glo Chemical Co., 258 Fourth Avenue, Brooklyn 15, N. Y.

APPARATUS. Chemicals, ounce quantities, catalog 10c. Fleischer's Laboratories, Everett 49, Mass.

HANDBOOK For chemical experimenters. Illustrated, hundreds of experiments, 50c. Experiment booklet 15c. Supply catalog 5c. Reading Scientific Company, Reading, Penna.

HELP WANTED

RELIABLE Man with car wanted to call on farmers. Wonderful opportunity now. \$15-\$20 a day. No experience or capital required. Permanent. Write today. McNeess Co., Dept. 78, Freeport, Ill.

BOYS Wanted. Over \$50 week! Sell name plates for front doors. Write National, 214-U Summer, Boston, Mass.

AGENTS WANTED

DISTRIBUTOR Salesmen wanted to wholesale guaranteed Reflex Spark Plugs as a sideline to dealers, garages, service stations, fleet owners. Big profit. Repeat orders. Exclusive territory. The Reflex Spark Plug Co., 10902 Madison Ave., Cleveland 2, Ohio.

AMAZING Offer—\$25 is yours for selling fifty \$1.00 boxes of entirely different, new deluxe all-occasion cards. Each box sells for \$1.00, your profit 50c. It costs nothing to try. Write today for samples. Cheerful Card Co., Dept. 270, White Plains, N. Y.

SILVER Cleaning, plating, polishing, liquid (NuSilver). Apply with cloth. Renew silver-plated ware, articles, pieces. Silverplates brass, copper, bronze. Female, male, agents wanted. Part or full time. NuProcess Products, Aurora, Illinois.

MEXICAN Feather pictures. Unusual novelty. \$1.00 (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Aztec Art-P. Apartado 762, Mexico City.

HOT Items. Door name plates, knockers, numbers, etc. Complete line. Catalog available. Hub Stamping, 355 Congress, Boston, Mass.

EXCELLENT Opportunity for men and women. Sell beautiful chrome-plated monograms for cars, motorcycles, luggage, purses, wallets, keychains, etc. Contact Charleston Monogram Co., P.O. 1291, Charleston, W. Va.

STRANGE "Dry" window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee, 119, Akron, Ohio.

SPOONHOLDER—Clips on cooking pans. Essential kitchen tool. Sells easily. Agents write. Century Products, Dept. F, Box 287, Jackson, Michigan.

WANT Pleasant outdoor work in a business of your own? Good profits selling over 200 widely advertised Rawleigh home/farm necessities. Pays better than most occupations. Hundreds in business 5 to 20 years or more! Products-equipment on credit. No experience needed to start. We teach you how. Write today for full particulars. Rawleigh's, Dept. C-145-PPM, Freeport, Ill.

DISTRIBUTORS—Automobile accessories. Two new 25c and \$1.00 items. Honestly sell-on-sight. Free details. Lynn, 5710 Bankfield, Culver City, California.

AGENTS—Jobbers: sell Pre-Eze fast penetrant; plasticize permanent type acid-proof, heat-resisting rust inhibitor coating. Pre-Eze Chemical Corporation, 1019 Virginia Ave., N.E., Atlanta, Georgia.

EARN Money quickly, easily, showing greeting cards, stationery, wrappings, many unusual items. No experience. Up to 100% profit. Send today for everyday assortment on approval. Free display folder. Thomas Terry Studios, 200 Union Avenue, Westfield, Mass.

FREE! Big box actual full size packages foods, groceries, home needs, sent f.o.b. factory. Try them at home and show friends. World beating money making opportunity. Write Zanol, Richmond St., Dept. 6089C, Cincinnati 3, Ohio.

EARN Big money fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. PM-348, Rochester, Ind.

AT Last! Something new and sensational in everyday cards. New gorgeous satin and velvet designs. Get orders fast. Big profits. Imprinted stationery, 14 assortments for year 'round occasions, retail 80c to \$1. Get samples on approval. Puro Co., 2801 Locust, Dept. 840-C, St. Louis 3, Mo.

EXTRA Money fast. Sell friends exclusive greeting cards, stationery not obtainable elsewhere. 37 boxes. Profits to 100%. Bonus. Quick selling everyday, birthday, gift wrapping assortments; exclusive name imprinted, engraved name stationery. Write for free stationery samples and all-occasion samples on approval. Special offers. Regal Greetings, 19 W. Woodruff, Dept. PM, Hazel Park, Mich.

BE Independent, run your own magazine order business. No capital, no experience needed. Helps furnished. Opportunity unlimited. Send today for free wholesale catalog. McGregor Magazine Agency, Dept. 12, Mount Morris, Illinois.

GREETING Card money-makers. Birthday, Easter, Mother's Day, Descriptive folder free. Greenport Art Company, Dept. 838P, Brooklyn 15, New York.

PROFITS To 100%, selling everyday greeting card assortments. Details and assortment on approval. Glorian, Dept. 22, 515 East 45th Street, Brooklyn 3, New York.

PERSONALIZED Piggy banks. Big profits. Details free. Hall's, Iowa City, Iowa.

EASY! Fascinating! Profits to 100%. Bonus. 31 new greeting card boxes 30c up, 5c and 10c individual cards, stationery. Request free name imprinted and floral stationery samples, free 32-page catalog and \$1.00 all occasion assortment on approval. Special offers. New England Art Publishers, North Abington 102, Mass.

CALL On friends with greeting card assortments, birthday, get-well, others. Floral stationery. Gift wrappings. Big profits. Experience unnecessary. Samples on approval. Wallace Brown, 225 Fifth Ave., Dept. C-4, New York 10.

QUICK Extra cash. Sell value plus greeting cards. New 1948 line. 30 boxes retailing 60c to \$1.00 each. "Flower-of-month" and initial stationery, first name imprinted remembrance notes. Profits to 100%. Extra bonus. Special offers. Write today for feature all-occasion samples on approval and free name imprinted. Floral stationery sample portfolios. Elmira Greeting Card Co., M-57, Elmira, N. Y.

BY Money selling plastic tablecloths, curtains, aprons. Lowest prices! Durever, 314C Albany Avenue, Brooklyn 13, New York.

\$1 STARTS You in business. Sell deluxe ties, 100% wool interlining. Costs you only \$7 per dozen, you make \$5.00 dozen. Send \$1.00 for special introductory offer two deluxe ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-21, New York 10.

BACK Again, fast selling pre-war Ad-justo pocket knives also nail files, big profits, exclusive territory, sales plans. Meyer Specialty Co., Granite Bldg., St. Louis 2, Mo.

MORE Money—Quick. Big profits to 100%. Bonus. Show friends complete line greeting cards, gift wrappings, stationery. Experience unnecessary. Send today for free samples name imprinted, floral stationery and money making new 1948 feature all-occasion box on approval. Special offers. Tom-Wat Studios, Dept. PM, Bridgeport, Conn.

A Dress Yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. K-9128, Cincinnati, Ohio.

BIG Money in selling beautiful solid glass paper weights with flowers, lilies, butterflies inserted in them. Offices, novelty shops, buy on sight. Send for sample, \$2.50. Money refunded if not satisfied. Agents wanted. Smiths Glass Shop, Box 165, Star City, West Virginia.

WANT Twenty to thirty dollar a day job? Something new, Shure-shot seller to furnished prospects. Sole representative in selected territory. Send two dollars for outfit on our Simplified Memorial, or write for particulars. First come, first accepted. Pyramid Memorial Company, Box 421, State College, Penna.

SELL Ultra blue stock signs to stores, 1000 slogans, comedy, general, religious. 7x11, cost 6c, sells 35c. Make money. Sample free. Lowy, 8 West Broadway, Dept. 358, New York City 7.

POCKET Pal; replaces pocket knives. New, safe, beautiful. Always razor sharp. 50c seller. 231% profit. \$15.00 or more daily. Agents, salesmen, distributors. Nelson Manufacturing Co., 222 W. Kellogg, St. Paul 2, Minn.

MICRO 16 Pocket camera. Advertised in Life, Look, etc. Free folder, wholesale price list and photo. Pittsburgh Photo Shop, Dept. A-4, 1618 Westmont Avenue, Pittsburgh 10, Penna.

BIG Money! Selling personal stationery, cards, announcements, etc. Raised printing. Andrew Peck, 98 Green, Battle Creek, Michigan.

BIG Money fast! Sell plastic garment bags, curtains, tablecovers. Free swatches. Star, 261 Fifth Avenue, New York.

MAKE Money at home like I do! Write immediately. Duffy, Covington, Ky.

SWEET Smelling beads sell on sight. Low jobbers prices. Mission, 2328P West Pico, Los Angeles 6, Calif.

UP To 122% profit! "Mad-Nets," \$1.00 novelty magnets. Free bulletin. Frederick, 4 South, Stamford, Conn.

YOUR Profit. 90c each sale. Sample \$1.00. Esdras Belanger, Plamondon, Alberta.

AMAZING Invention puts keen edge on old razor blades. Greatest discovery in ages. Whirlwind seller. Enormous profits. Write, Renu-It, 2609A North 61 Street, Milwaukee 13, Wisconsin.

DEALERSHIPS. Sweetline No-Rub Refinish, revolutionary cleaner-polisher. Instantly cleans, renews, leaves high gloss finish on hard surfaces without rubbing. For factories, stores, hotels, banks, theatres, restaurants, lobbies, bars, etc. Repeat sales. Utilized by Army, now available generally. H. C. Sweet Co., 3727 Fenkell, Detroit, Michigan.

SUBSCRIPTION Representatives wanted, everything free. The Fireside, West Salem, Illinois.

MAKE Big initial commissions and steady repeat money selling Pronto Stencil Duplicators and Pronto Photocopy Equipment. Write for free sales kit, indicating interest in one or both lines. Pronto, Inc., 515 Dempster, Evanston, Ill.

EVERYDAY Cards. Earn \$5.00 with every ten \$1.00 assortments you sell. Also wrappings, note paper and personalized stationery. Unusual quality. Send for samples today. Howard P. Ellis, Dept. PM-4, Pitman, N. J.

BIG Easy profits. Sell friends famous Wear Wright nylon hosiery, lingerie, blouses, sportswear. Free sample display cards. Complete line greeting cards. Samples on approval. Special offers. Wear Wright Company, 1709 Arch Street, Dept. B, Philadelphia, Pennsylvania.

SELL Paklite combination cigarette case and lighter. Write for details. Peerless Sales, Box 25, Curtis Bay 26, Md.

COLLECT Advance commissions on phone orders developed by co-operative advertising in your local newspaper. Write for details. Home Products Corporation, 4403 N. Sheridan, Chicago 40, Illinois.

NEW. Exclusive. Fluorescent portable and pin-up lamps. Big market, large profits, multiple sales. Nationally known manufacturer. Unusual opportunity. Write Arcurus, Marblehead 4, Mass.

DISTRIBUTORS: New, exclusive, competes with outfits up to \$1000. Retail \$79.50. Trail-O-Camps, Sacramento 17, California.

SELLS At sight. Stainless steel carving sets \$18 doz. Samples available. 125 other fast sellers. Manufacturers, 264 5th Ave., New York.

CREW Managers, wagon jobbers, agents! Established manufacturer can supply you with top quality floor waxes and polishes all sizes from pint to drum. Write Windsor Wax Co., Inc., Dept. P.M.1, Hoboken, N. J.

MAKE Perfume. Profitable, sparetime home business. Men, women, write "International," 6347 Parnell-X6, Chicago 21, Illinois.

EARN Big profits showing advertising calendars, fans, pencils and novelties. Beautiful products sell easily. No experience necessary. Full or spare time. The Geo. H. Jung Co., 1998 Jung Bldg., Cincinnati 2, Ohio.

WHOLESALE! Balloons, novelties, watches, jewelry, premium goods. Collins Co., Forsyth 3, Georgia.

SELL Ball pens. Three samples \$1. Thomas Pens, Box 3, Williamsburg, Brooklyn 11.

"NEW Car washer"—Eliminates bucket, sponge. Wash car in few minutes. Autoists buy on sight. Great profits. Literature free. Jon Henri Co., 101 Neave Building, Cincinnati 2, Ohio.

BE The Popular Mechanics representative in your neighborhood and earn big profits in your spare time. Write Popular Mechanics Magazine, Room 408M, 200 E. Ontario St., Chicago, Ill.

90c PROFIT Each \$1 sale! Sell real mothproofing solution. Employ agents. Experience unnecessary—we tell you how. Kinford, Wayne 3, Penna.

AGENTS, Distributors—Personal name plates for homes, office. Big profits. Al Peterson Associates, Box 822, Providence 1, R. I.

\$3 FIRE Extinguisher; quick sales, wholesale or direct; liberal profits. "Fire-Killer," 109 N. Franklin, Syracuse 1, N. Y.

MAGAZINE And bookmen can increase their income by selling my lawn book. 100% profit. Agents copy 50 cents. Leslie Kerr, 3825-A Tenth Street N.W., Washington 11, D. C.

BIG Money selling tooth powder. Write today. James Walker, 633 Plymouth Ct., Chicago, Ill., Dept. 1.

DEMONSTRATE Vanishing cigarette trick. Working sample. 25c. Scheetz's, Sellersville, Penna.

FREE Sample! Big profit opportunity with amazing glow-in-the-dark house numbers, switch plates, pictures, decals, religious articles. Represent large manufacturer. Madison Mills, 303 Fourth Avenue, New York, N. Y.

STEADY Large earnings; real staple, rubber hose; sell jobber, wholesaler, consumer, industry, automotive; no territory restrictions, no investment. Advertised line, generous, protective deal, full or part time. Ace Hose & Rubber Co., 769 Van Buren St., Chicago 7, Ill.

100% PROFIT. No investment, handle quality Fotostamps. Amazing glossy photographs, gummed stamp form. Business year round. Free samples, particulars. American Foto Stamp Co., 103 East 125th St., Dept. PM1, New York 35.

SCHOOL Seniors: Sell classmates superb Craftcards for super profits. Write Craftcards, Box 235(AK), Pittsburgh 30, Pennsylvania.

MAKE More money selling personal initialed individualized belts, buckles, cap badges, tie holders. 2000 emblems to choose. Big profits, whole or part time. Write today special outfit offer. Hookfast Specialties, Box 1425, Dept. 6, Providence, R. I.

AGENTS. Sell finest food products direct to homes. Successfully sold for 25 years. Big profits. Powerful combination sale plans make sales easy. Permanent repeat business. Samples furnished. Live territories open to distributors. Mother Hubbard Products Co., 4139 Grand, Dept. P.M., Chicago.

FREE Water and our concentrates, makes flavors, lotions, shampoos, 72 products, labels, bottles furnished. Qualco, E-20030 Russell, Detroit.

INFORMATION — Wholesale supply sources. Money-making plans. Increase your income! Write Reynard Service, Smithfield 3, Ohio.

QUICK Sure money. Selling Annie Blain flavors. New Brunswick, New Jersey.

SCHOOL Seniors—Earn 40% commission selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Send for free sample kit. Printcraft, 1425 E. Elm St., Scranton 5, Penna.

SCHOOL Seniors! Your postal will bring our wonder, Kwick-Sell Cardalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235(L), Pittsburgh 30, Pennsylvania.

AGENTS—Big line including food products. Fast selling premium and bargain deals. Low prices. Send card for big outfit offer with gift. Ho-Ro-Co, 2725 Dodier, St. Louis 7, Mo.

100% PROFIT With new electric gas lighter, eliminates matches, pilot. Write Optical Research Products, Fairview, N. J.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Raleco" XL-Roxbury, Boston 19, Mass.

MAGIC Cleaner and laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 5007 Irving Park, Chicago.

137 COMPLETE Plans for starting own business; local—mail order. Particulars free. Elite Co., 220 Grand St., New York 13.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

GOLD Lacquered window sign letters. Large sizes penny each. New foils. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

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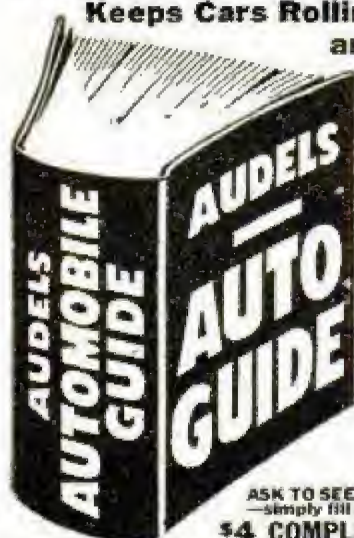
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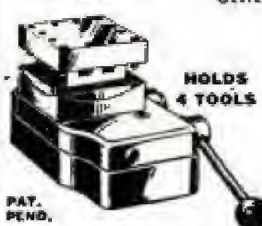
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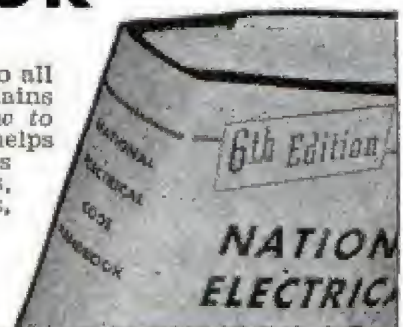
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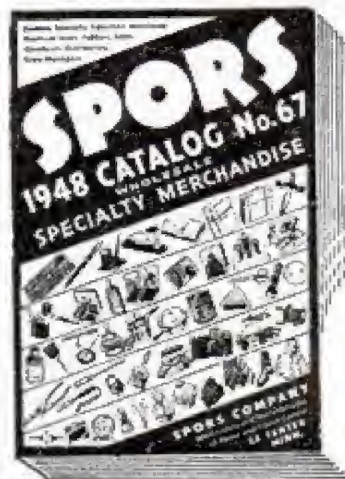
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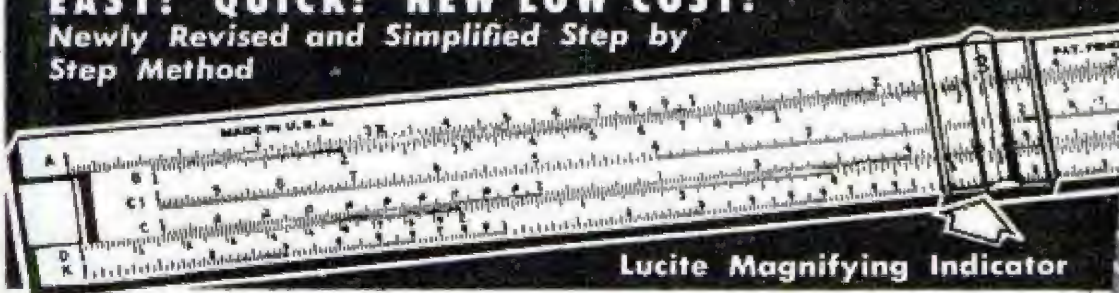
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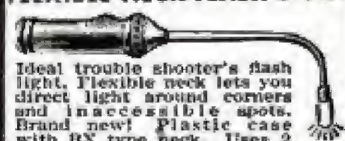
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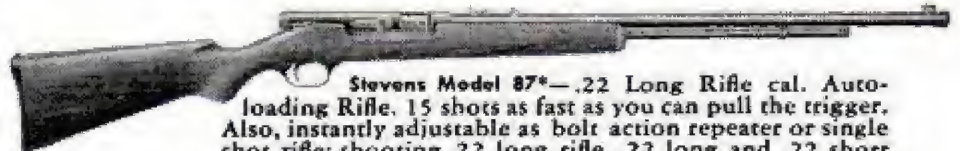
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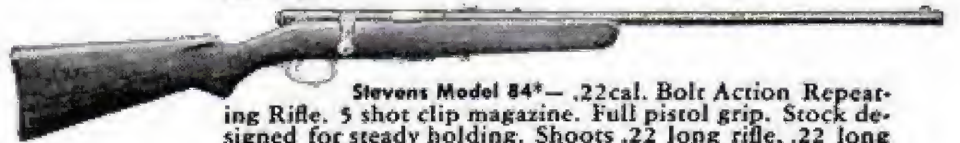


GET BEHIND A STEVENS . . .

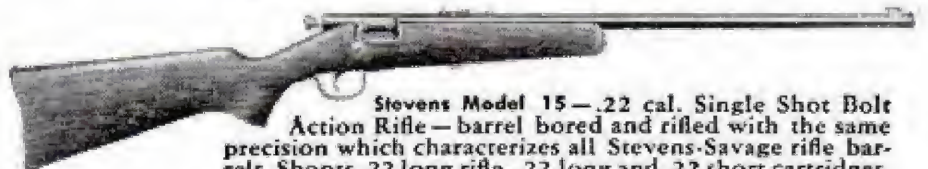
. . . For small game hunting, pest riddance, plinking or informal target shooting—for *more* all around sport and greater values—get behind a rifle or shotgun built by Savage Arms Corporation. Write for new free catalog. Savage Arms Corporation, Firearms Division, Chicopee Falls, Mass.



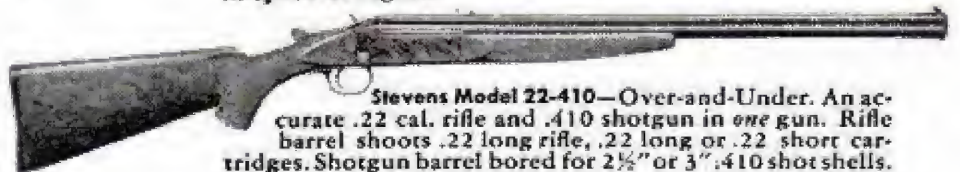
Stevens Model 87*— .22 Long Rifle cal. Auto-loading Rifle. 15 shots as fast as you can pull the trigger. Also, instantly adjustable as bolt action repeater or single shot rifle; shooting .22 long rifle, .22 long and .22 short cartridges.



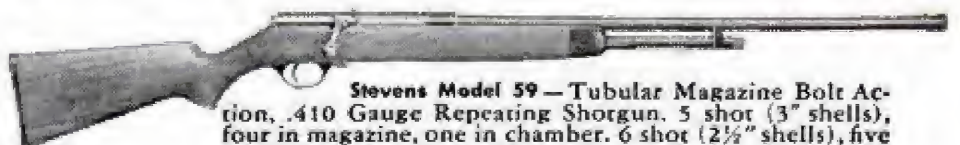
Stevens Model 84*— .22 cal. Bolt Action Repeating Rifle. 5 shot clip magazine. Full pistol grip. Stock designed for steady holding. Shoots .22 long rifle, .22 long and .22 short cartridges.



Stevens Model 15— .22 cal. Single Shot Bolt Action Rifle—barrel bored and rifled with the same precision which characterizes all Stevens-Savage rifle barrels. Shoots .22 long rifle, .22 long and .22 short cartridges, hi-speed or regular.



Stevens Model 22-410—Over-and-Under. An accurate .22 cal. rifle and .410 shotgun in *one* gun. Rifle barrel shoots .22 long rifle, .22 long or .22 short cartridges. Shotgun barrel bored for 2½" or 3" .410 shot shells.



Stevens Model 59—Tubular Magazine Bolt Action, .410 Gauge Repeating Shotgun. 5 shot (3" shells), four in magazine, one in chamber. 6 shot (2½" shells), five in magazine, one in chamber.

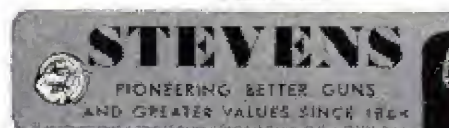


***New Peep Sight**—Now these Stevens .22 caliber rifles are available, at slight extra cost, with a new, specially designed peep sight with elevation and graduated click windage adjustment.

HELP!—

For The New Shooter

The safe and accurate handling of firearms is an American tradition. It's worth perpetuating and you can help by starting the young or new shooter off right. For advice and special literature on setting up a program, write: Sporting Arms and Ammunition Manufacturers' Institute, Dept. 4, New York 16, N.Y.





POPULAR MARCH 1948 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 89 NO. 3

Uncle Sam Weighs His Resources

Weyerhaeuser Sales Co. photo

HOW BIG is America's bank balance? Our savings account is not the cash in the federal treasury or the total money in circulation; money is only a working symbol of a nation's economic wealth. The bank balance that really counts—that makes the difference between prosperity and depression—is the raw materials in and above the ground.

Nobody knows the exact extent of scores of vital natural resources buried in the earth, without which our civilization would rapidly about face to that of the Stone Age.

By Bill Reiche

We could find out by means of an exact geological mapping of the nation, of which only 10 percent has ever been adequately surveyed, at a cost of a billion dollars and 20 years' time, according to Interior Secretary J. A. Krug.

In a recent survey of America's needs and resources by the Twentieth Century Fund, an independent, endowed organiza-

tion, we are reminded that we are a naturally rich but spendthrift nation. More than any other country, with the possible exception of the Soviet Union, it

Buried treasure—coal and gold, iron ore and oil—and other resources make the U. S. rich. The question is: Will they hold out?

There's plenty of elbow room in this lead mine. A power shovel loads ore at the bottom, higher up a locomotive rolls past, and from a catwalk at the top workers sink blast holes in the wall.

Bureau of Mines photo



states, we have the resources we need within our own borders. But in almost every category we are the world's leading consumer and, in many important categories we use more than the rest of the world combined.

Our national-resources bank balance is important. Shortages of vital materials would mean higher prices and fewer jobs; the exhaustion of first-grade iron ore might result in the employment of three or four times as many men to extract an equivalent amount of the metal from the earth in second and third-rate ores, thereby dislocating our domestic economy through wholesale shifting of labor.

In his recent report to President Truman on national resources and foreign aid, Secretary Krug states:

"... raw-material resources are being put to use at rates that exceed past peacetime records. This unprecedented economic activity has resulted in the attainment of a gross national product, or total value of final goods produced or in progress, of 204 billion dollars in 1946 and a rate of 225 billion dollars annually for the first six months of 1947 ..."

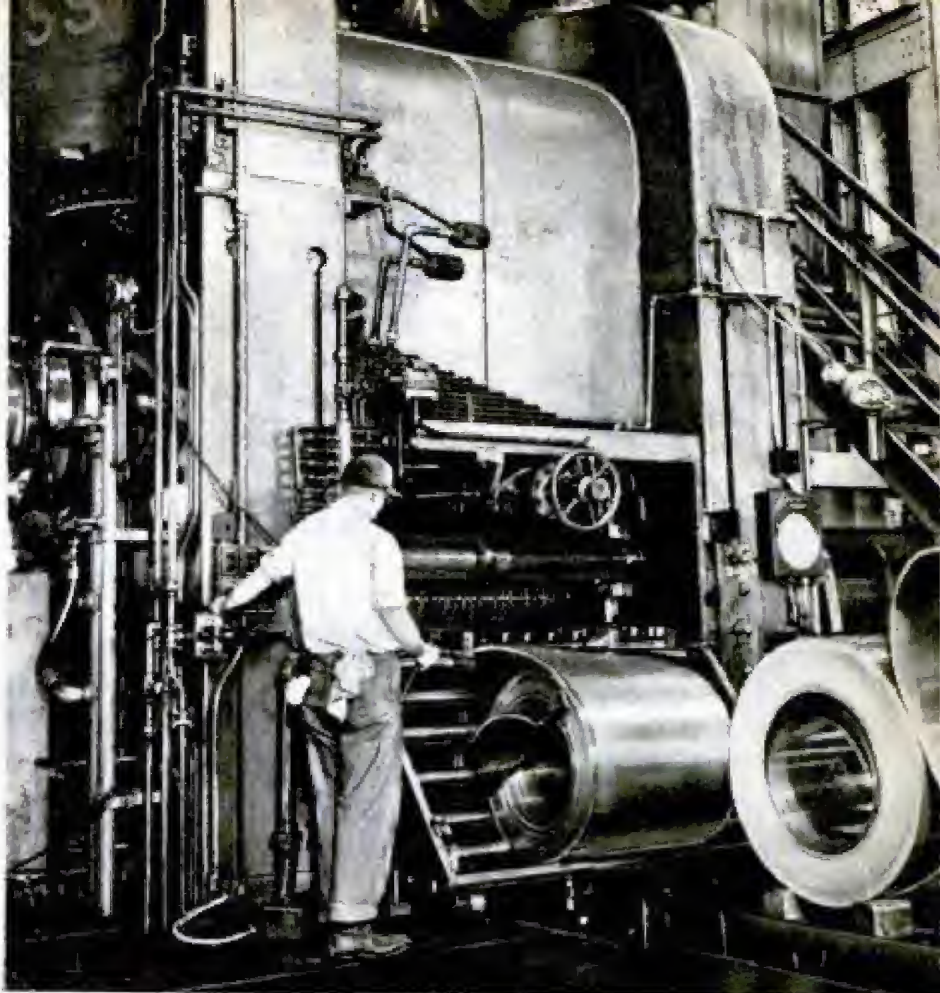
Against the possibility of another war must be considered the availability of strategic materials. During a war everything from wheat to industrial diamonds is of strategic importance. But in some of the most critical materials we have either very minor reserves or none at all.

It's difficult to estimate the reserves of our natural resources. A figure on how long reserves of a given material will last at a given rate of consumption means very little when we do not know the extent of new reserves which will be discovered within that period. But the Bureau of Mines and the Geological Survey have reported to a sub-committee of the Senate Committee on Public Lands an estimate of our reserves of two score minerals.

The problem children in this family of minerals are petroleum, lead, zinc and copper—they present the most serious scarcity problems.

Proved petroleum reserves give us about a 15-year supply.

MARCH 1948



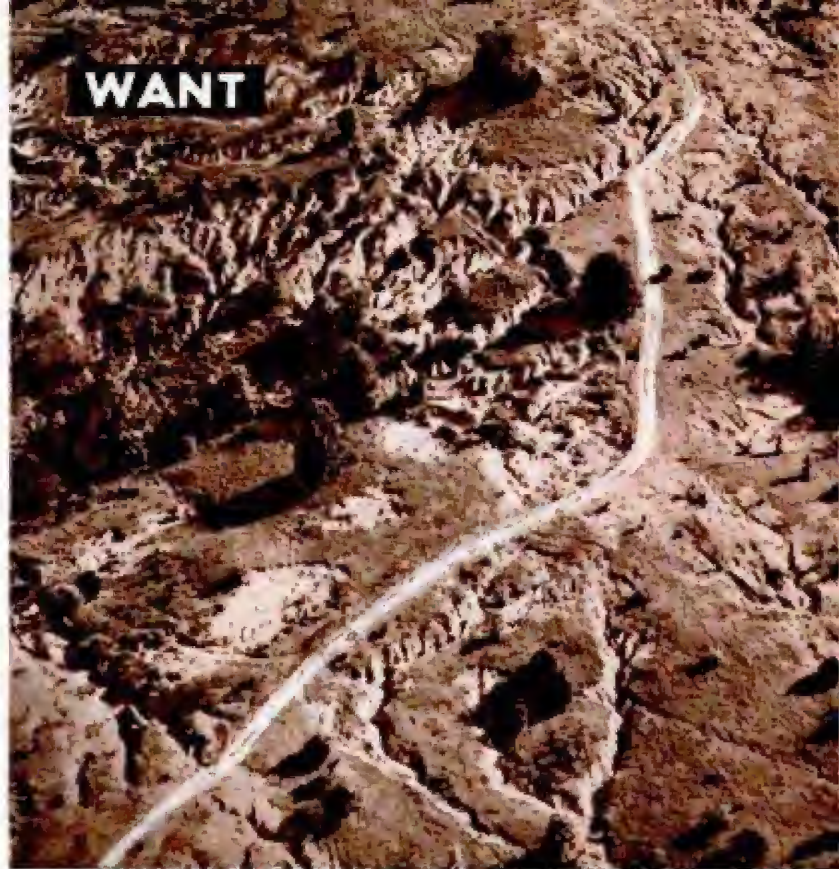
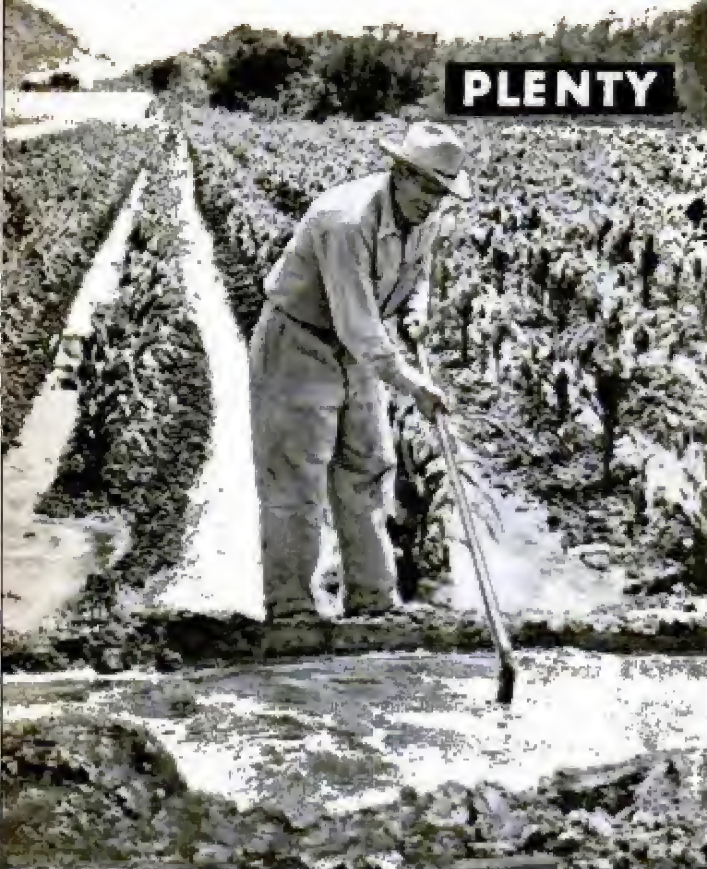
U. S. reserves of bauxite, from which aluminum (being rolled into sheets above) is produced, will last an estimated 23 years



Standard Oil of N. J. photo

Above, oil derricks laid out on a 40-acre spacing plan for conservation of supply. Below, power loader fills truck with shale from which oil is removed at the government's retorting plant





Contrasting photographs show what can happen to our resources. Left, wasteland becomes fertile when proper steps are taken to irrigate it. Right, a lack of conservation practices brings on erosion and ruined land

By using the rule of thumb that potential reserves approximate those known, we can estimate that we have enough to last us three decades. Oil has held a leading place in the "easy come easy go" category of raw materials. A Johnny-come-lately among fuels, it was the source of only 4.5 percent of the energy produced here in 1899, but by 1945 it accounted for more than 32 percent.

Large reserves of petroleum may be discovered before we hit the bottom of the barrel, but if not, there are alternative methods of providing liquid fuels. Oil-shale deposits in Colorado, Utah and Wyoming are considered potential sources of five times the amount of oil in our proved

petroleum reserves, but production costs might run from 50 to 100 percent higher than at present. In addition, big pipe lines would be required to transport the oil to the Midwest and Eastern markets.

The hydrogenation of coal, an old British and German process now being pioneered in this country by the Pittsburgh Consolidation Coal Company and Standard Oil, is another ace in the drying hole. Production costs by this method would run 50 percent higher than with shale, but transportation costs would be less since coal is more centrally situated.

Lead, with only a 10-year supply in sight, is everybody's headache since the shortage is worldwide and in some of its

Our reserves of high-grade ore for the production of steel are estimated at 11 years' supply, but new methods are making practical use of low-grade ore. Below, ore ship being unloaded at U. S. Steel docks



major applications substitution is virtually impossible. These include storage batteries and cable coverings. Consumption of the heavy metal has tapered off from the wartime high but is likely to continue at an advanced level.

All the lead being used today cannot properly be called raw material since much of it is salvaged. Conservation of this material has been practiced to some extent in the paint industry, where titanium, derived from rutile and ilmenite, now is used along with lead. Some authorities say titanium is superior to lead in paints. Thousands of tons of lead are burned up annually, however, in anti-knock gasoline—a procedure considered wasteful by persons who believe high-test fuel can be made without consuming a vanishing mineral.

Our supply of zinc, domestically estimated to last 20 years, will probably depend on imports of more than 50 percent. This metal is likely to be replaced by a number of substitutes, such as titanite oxide for zinc oxide, aluminum for castings and steel, plastics and glass for sheet metal.

Copper, a work horse known since ancient times, is devoted

(Continued to page 272)



Harnessing rivers adds to our resources by providing power and water for irrigation. Above, men at work at Grand Coulee Dam

Huge plants like this reduction works at Anaconda Copper need lots of ore and without careful planning we may face depletion

Anaconda Copper photo





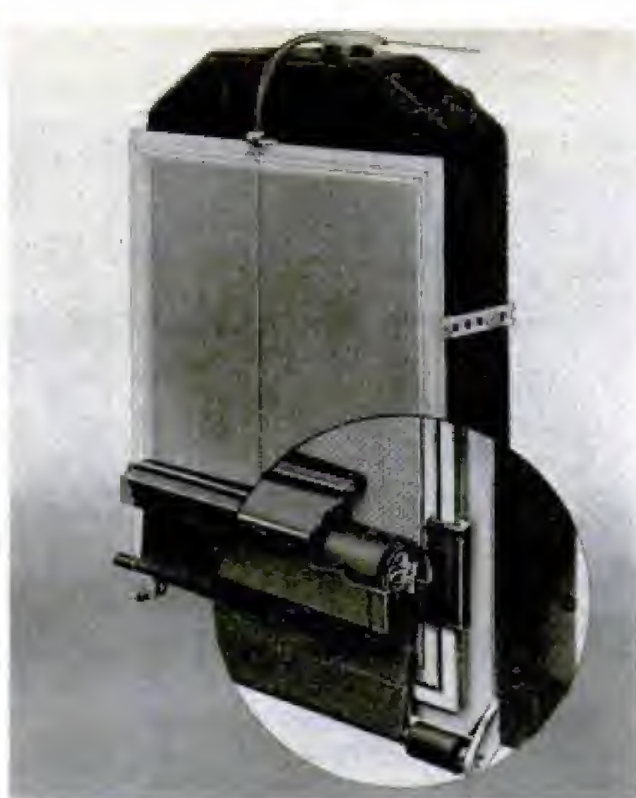
Arm 'Sweeps' Fingers From Danger

Riveting machines can't smash the fingers of unwary operators when used with a safety mechanism invented by John Mulligan of New York City. A projecting arm operated by a spring is attached to the working surface of the machine. The arm "sweeps" the fingers away from the work before the machine slams down on the rivet. Riveting machines frequently cause smashed fingers, according to insurance companies.



Canadian "Smoke Jumpers" Slide to Work From Plane

Parachutist-firemen plummet into space from a "coal chute" to fight blazes in northern Saskatchewan. Scarcity of landing fields in the lake-dotted woodlands has forced the government to drop its



"Window Shade" Radiator Cover

Auto radiators are protected by a combination bug screen and winter cover. The screen is installed permanently on the radiator. The cover is mounted on a spring-action roller much like a window shade. The roller moves up a track along the frame of the screen, covering the bottom of the radiator first. A cable runs from the cover to the glove compartment, permitting the driver to raise the cover without leaving his seat.



"smoke jumpers" from flying boats. The chute carries them clear of the cumbersome pontoons. Jumpers sit in the doorway, with legs dangling down the chute, until the drop signal is given.



"FLYING MOTORCYCLE"

Two 10-pound engines of the simplest type keep the world's first ramjet helicopter in the air. Dubbed the "flying motorcycle," it was built by McDonnell Aircraft for the U. S. Air Force for artillery spotting, courier service and short-range observation. The tiny craft weighs only 310 pounds, flies 50 miles an hour and lifts 300-pound loads. Most rotary-wing craft can carry loads equal to only a small percentage of their weight. The athodyd-type engines, resembling stovepipes, are

at the tips of the two-bladed rotor. Air rammed into them by the blades' whirling is burned by a fuel mixture injected through the blades and forced out the rear, producing thrust. After initial fuel pressure is built up, centrifugal force keeps the engines fed. Still classed as a "flying test stand," its frame is simple welded steel tubing, with a single seat and a large rudder for directional control. Rotor angle is controlled directly by an arm extending down in front of the pilot. Propane has been used thus far, but engineers are working on gasoline-burning units.



Movies of Television Show Provide Permanent Record

With a 1200-foot magazine that permits continuous recording of a half-hour program, a specially designed movie camera photographs television programs directly from the monitor tube at the broadcasting station. The double-chamber magazine holds both unexposed and exposed film and can be removed in a lighted room. The camera will be used by stations to provide a permanent record of their programs.

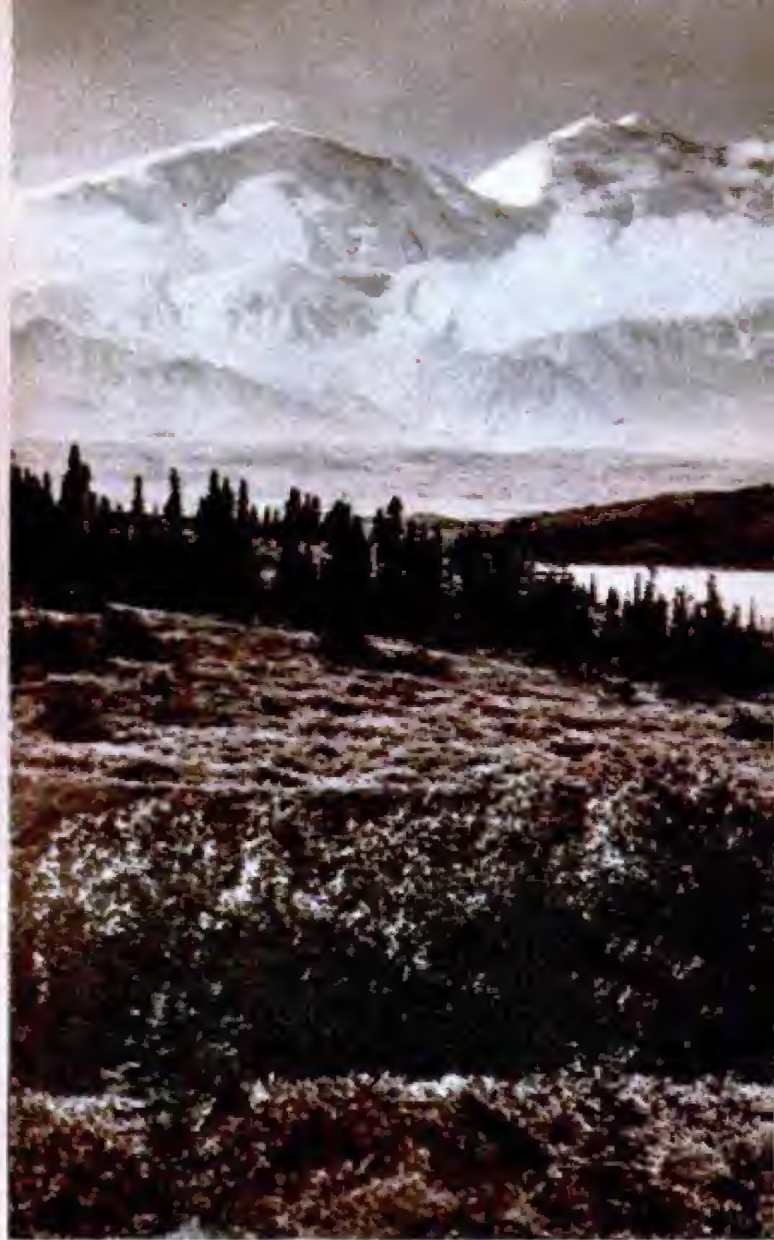
Navajo and Hopi Indians in Arizona are given one-day dry-cleaning service by Wayne L. Troutner, who picks up and delivers ceremonial garments, rugs and blankets in a small plane.

BIGGER THAN TEXAS

By William E. Warne



Ass't Secretary of the Interior
Warne presents a first-hand story
of Alaskan opportunities and in-
troduces some pioneers of 1948





As seen across Wonder Lake, ice-capped Mt. McKinley typifies the rugged beauty of Alaska—America's last frontier—where there are plenty of opportunities such as small business or farming for the 1948 pioneer

National Park Service photo

ALASKA, which used to be thought of as a land of perpetual ice and snow, has suddenly assumed great importance to the United States because it is the cross-roads of the air age.

Intercontinental routes, via the Great Circle and over the top of the Pole, are already using Alaska as the hub of their wheel. This giant "hub" covers 586,400 square miles which makes it considerably bigger than Texas which has a total area of 267,339 square miles.

With eyes focused sharply on Alaska for the first time since the Gold Rush of 1897, the American people have suddenly discovered that their former appraisals of this vast, beautiful, empty land were wrong. It is not a land of perpetual ice and snow, but a land of opportunity, albeit one that challenges even rugged men in the process of making a place for themselves. Strangely enough, the great glaciers and the tremendous winter snows that gave Alaska its reputation are confined largely to the mountains and the

rough coastal areas of the south. The vast heartland of Alaska, stretching from the Kenai Peninsula up Cook Inlet to Anchorage, through the Susitna, Matanuska and other river valleys, down the Nenana and Tanana Valleys to Fairbanks and to the Yukon and out the Alaska Highway to Tok Junction, has many areas of mild summers with long golden days and fair growing seasons for crops.

Alaska is a varied land. Superimpose a map of Alaska drawn to the same scale on a map of the 48 United States and it extends from South Carolina to southern California and from the Mexican border to northern Minnesota. In land area alone, it is one fifth the size of the 48 states. It is readily seen that such a great area spread in peninsulas and islands over so vast a part of the world would not be all alike. Southeastern Alaska is a land of heavy rainfall, great beauty, fiords cutting into high mountains near the sea, entrancing spruce-covered hills and slopes, quiet, protected waters among the islands and



Odd business for Alaska (left) is this artificial ice plant operated by an ex-Texan in Anchorage. Right, McKinley Airways, an independent air-freight line, flies pigs from Dawson Creek, B. C., to hog farm near Anchorage

the shoreland, glaciers that come down to the sea, a land of fishing and hunting where boats substitute entirely for roads, and the airplane is the only means of quick transportation.

Central Alaska, the heartland, is not so very different from the northern plains states. Its climate is colder and it is cut here and there by high mountains. Otherwise, much of it resembles northern Michigan and Minnesota. Here Alaska's only railroad serves its biggest cities—Anchorage and Fairbanks, and the Alaska Highway comes up from the south through Canada to join the territory's only other important road, the Richardson Highway, near Fairbanks where the railroad meets

the great rivers of the north and boats begin to ply the Tanana and Yukon Rivers toward the Arctic. The great airdromes of the future will be located in the heartland, and here most of the farming opportunities will be found.

The Aleutian Islands, of less than fond memory on the part of many a GI, are different again. They are isolated, storm-bound, rough, and at times forbidding. Their climate is not extreme, but the grasses that grow lush on their slopes are not pastured because there is no means to get the wool, hides and meat that the livestock would produce out to market.

Bristol Bay, Kuskokwim Bay, Norton Sound and the Kotzebue Sound on the

Picturesque Alaskan salmon cannery does its share of a business that exceeds 50 million dollars a year

U. S. Fish & Wildlife photo



western face of Alaska are surrounded by low delta lands. Bristol Bay is famous for its salmon and other fisheries, but except for the short fishing season, the lands that front on the Bering Sea have little activity. The Eskimos trap furs and fish here, and trade with them is important. Mines are in operation in some of the hills for such rare metals as tin, platinum and gold. Other minerals found in the region include iron, nickel, zinc, silver, tin, lead and chromium.

The last region of Alaska is the Arctic slope and Colville River Basin. It is low, bleak and little used, although traces of oil have sent the Navy scurrying over a vast region, prospecting on a reserve set up for it.

Alaska's greatest need is population and the biggest opportunity for people who want to go there will be found in connection with businesses and activities that will contribute to the support and comfort of many people in the territory. There are problems to be overcome, transportation facilities need to be increased and improved, good housing is required, much exploration for minerals and testing of soils for agricultural needs to precede the final stage of development. These problems are being studied and worked on by local, territorial and federal officials. They will be solved in time.

Meantime, many sturdy individuals have pitted themselves against this hard land. The population of 75,000 before the war now exceeds 90,000, and Anchorage is among the fastest growing cities in the world.

Here are some thumb-nail case histories:

Robert Thompson went to Alaska in 1940 as an officer in "Castner's Cut-Throats." What he saw wasn't so different from his home in Moccasin, Mont. After the war, he and Aden Winkelman, his sergeant in Army days, built themselves Anchorage's most modern restaurant. It has been doing good business since the spring of 1947.

MARCH 1948



The Alaska Railroad prides itself on such modern equipment as this streamlined Diesel-electric locomotive which pulls an eight-car train

Dennis Fenno went to Alaska first as a fisherman when a young man and spent a summer or two on Bristol Bay. During the war, he served as a bomber pilot in Italy, but went back to Dillingham, a fishing village, and bought a half interest in the Dillingham Air Service—assets, one plane. He and two other former Army pilots now have three planes operating between Anchorage and Dillingham, carrying freight and passengers. There are many such stories of bush-line flying, because the airline is doing the job in Alaska that the covered wagon, the pony express and the early railroad did in opening up the West. Before air travel was introduced in Alaska, the interior was closed to all except the hardest adventurers who braved sub-zero weather and starvation in their

Fishing is Alaska's principal industry with the catch in a single year exceeding 460 million pounds. Here fishermen are emptying salmon trap





Department of Interior photo

Carcasses of super bison, mastodon, camels and horses have been washed from this ice bank in Cripple Creek. Below, trapper Bill Hawks at right from Kenai Peninsula arrives in Anchorage to sell his winter catch of furs (wolf, fox, mink, otter) to Wally Worth of the Alaska Fur Exchange



search for gold. Dog teams were the principal means of transportation.

In 1945, Vere Savage bought a small cannery at Ninilchik. A series of small disasters put him \$17,000 in debt. He told some young veterans at Anchorage of his trouble, including L. T. Gardner, whose home is Grants Pass, Ore.; Jack Schriber, formerly of Milwaukee; Peter Harris, Alaska-born; Walter Keck of Carter, S. D.; Ralph Mitchel of Craigmont, Idaho; Mike Rogers of Scarsdale, N. Y.; and Bill Fitzgerald of Kalamazoo, Mich. They formed a partnership, moved the cannery to Kasilof, rebuilt it, and late in the season of 1947 commenced packing "Polar Sea Foods." It looked as though their operation would be a success the first year.

Dan Lappala went to Alaska to help build Army facilities during the war and then joined the Seabees. He stayed at Anchorage after receiving his discharge and established a nursery. He bought stock from the Midwest and, though he says the going has been hard, is now receiving orders for Alaska birch and other products to export to "outside" buyers. (Alaskans refer to other parts of the U. S. as "outside.") Lappala says that he is in business to stay.

Jack Conright served two years at Fort Richardson near Anchorage. When he was discharged, he went into the furniture business and persuaded his brother Curly, an experienced furniture maker, to come from Tacoma, Wash. He now makes furniture in the basement of his store and has found a profita-

ble sideline in making seats, cushions and covers for the many jeeps which swarm Alaska.

E. J. Fortier took over the Weekly Times in Anchorage, renamed it *The Forty-Ninth Star* to emphasize the drive for statehood, and is building up circulation in central Alaska.

In addition, men are finding their livelihood in teaching and the other professions, in flying tourists to fishing lakes, in raising chickens, operating dairies, and scores of other jobs including farming.

Homesteading is occupying increasing numbers. Carving a farm out of the Alaskan woods is not child's play, but many are managing to win through. There are now 450 successful farms in the Matanuska Valley where the government project that won much comment a dozen years ago established 200 farms. This is one of the best farming areas. There are still some lands available for development there.

In summary, opportunities in Alaska are

Walter Pipple, who has 240-acre farm near Eagle River, is proud of his fine cabbage patch. Right, Ken Britt of Anchorage fish firm stands beside 400-lb. halibut caught in Cook Inlet not far from Anchorage

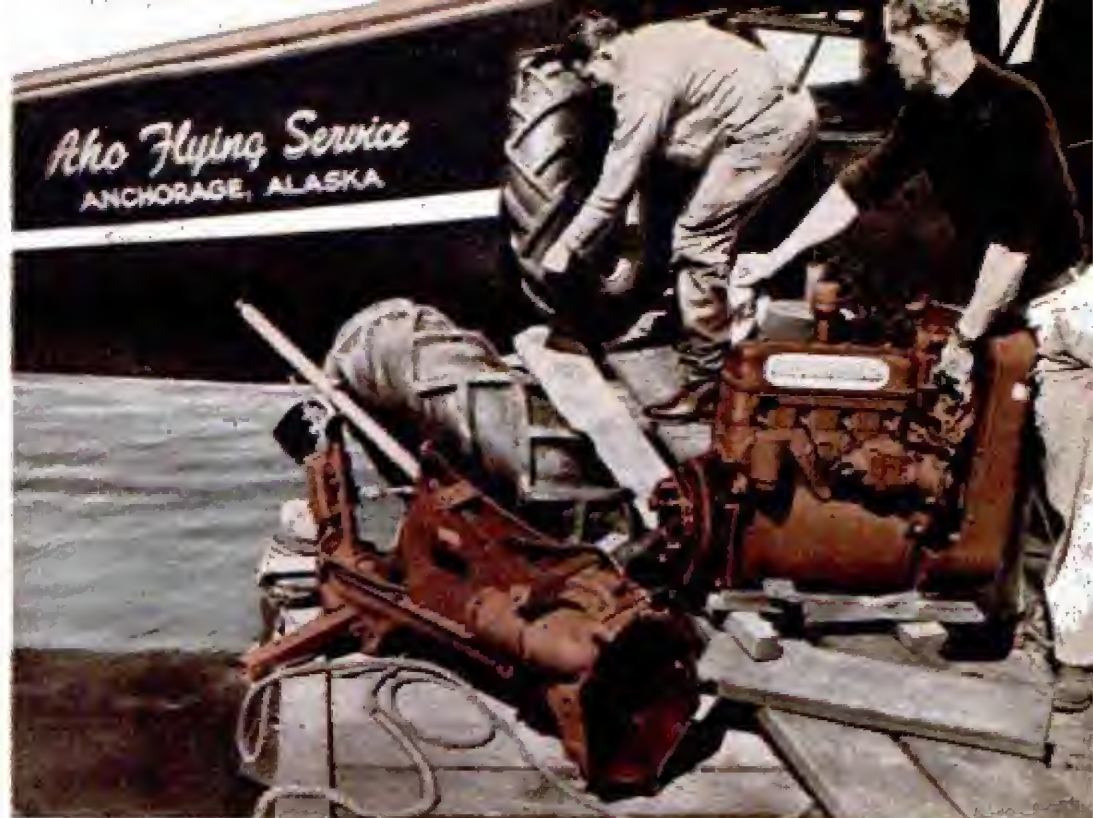
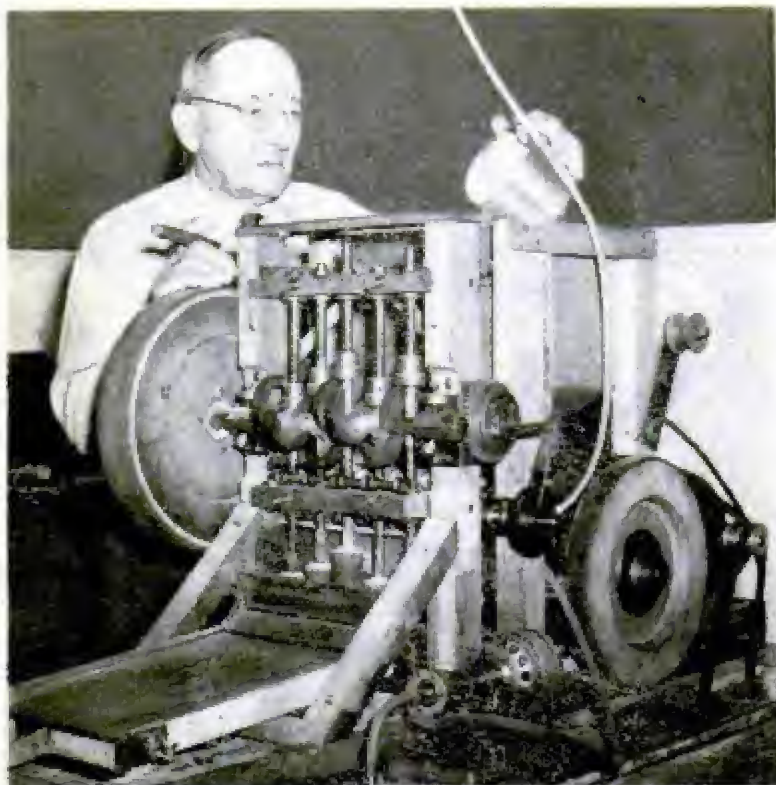


Photo by Robinson Studios, Anchorage

When Bud Branham, ex-Navy pilot who operates a big-game lodge at Rainy Pass, wanted a tractor he had it shipped from Anchorage by float plane

as varied as the land itself, but all of them involve hard work under difficult conditions because Alaska is not an easy land. The people who are required to populate it, however, will be found. Alaska, which has been a U. S. possession since 1867, is on its way to becoming a state and its great growth is immediately before it.





Basement Mill Turns Out Gold

In his leisure hours, Dr. Albert Boeck of Boise, Idaho, literally finds gold in his basement. Dr. Boeck owns a gold mine in the nearby mountains and has built a miniature mill in his basement to separate gold from impurities. The mill determines the richness of a vein with the accuracy of elaborate assays. Ore crushed to the size of coarse sand is fed into a battery of five "stamps." The stamps rise and fall twice each second, a total of 600 impacts per minute, to reduce the ore to the fineness of flour. The heavy gold sinks through the rock to the bottom of a pan, where it comes in contact with mercury to form an alloy of the two metals. In the last step the mercury is driven from the gold by heating the alloy with a blowtorch, leaving pure gold. Each hopper of high-grade ore yields about four ounces of gold, which Dr. Boeck sells to his bank for \$30 an ounce. The mill is more efficient than its 15-ton counterpart at the mine.

Atomic Boom Town Is Moved 24 Miles

As emergency housing for 16,000 persons, trucks and barges are moving barracks 24 miles to Richland, Wash., site of a big plutonium plant expansion. They had housed workers at Hanford, which boomed from 436 to over 50,000 as an atomic-bomb center.



Hand-Powered Tricycle

Powered by a hand crank, a homemade three-wheeled vehicle provides transportation for John Hobbs, a legless war veteran who lives in Wise, Va. Hobbs built the vehicle from bicycle parts, sheet metal, a few rods and bolts. He steers it with one hand and cranks with the other.

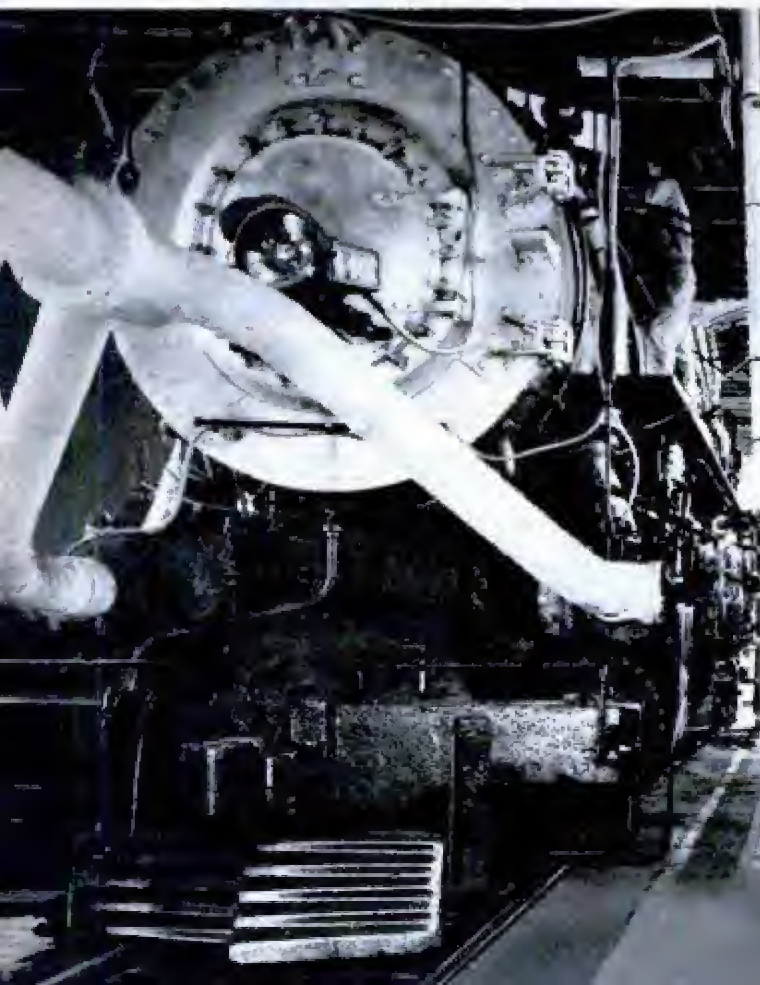
Exhaust Gases Prevent Plane Fires

Engine exhaust gases are being used to prevent fires in Navy planes. Containing too little oxygen to support combustion, they are used to blanket vacant spaces inside and around fuel tanks, after being cooled from 900 degrees Fahrenheit to about 70. The gases have about 9 percent less oxygen than atmosphere normally contains. A relief valve prevents excessive pressure which may build up during a long climb. A check valve stops the back-flow of gases.



LOCOMOTIVE CLINIC

Despite a roaring fire and a full head of steam, No. 4401 of the Southern Pacific Railroad doesn't turn a wheel. The locomotive is a clinic "patient" being tested to discover how increased steam and power can be obtained with less fuel. Engine streamlining has been removed as has its tender, cab, rods and pistons. The instrument panel (right) shows exactly what's happening in the engine and how efficiently it is performing. Water, injected into the cylinders, cools the steam just as would the work of pulling a heavy train. Excess steam created by the water is drawn off in a large "Y" pipe connected to the steam chests (below) and exhausted into a muffler outside the building. A tube, inserted above the fire door (top left), samples the flue and firebox gases that are tested for combustion quality. A hot-water meter (top right) measures the temperature and amount of water added to the boiler. Tests will bring about improvements in locomotive design.





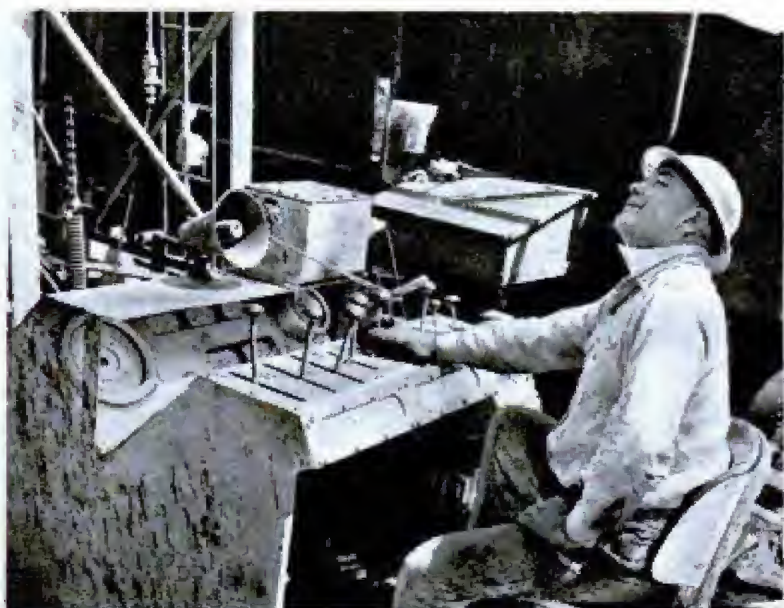
↑ Like a skinny "A," the twin-mast derrick is as high as a 12-story building. It is extended and telescoped by two electric motors and has a capacity of 300,000 lbs.

No organist, driller (right) sits at console playing a "tune" by electric controls that guide the drill. The music he wants to hear is the roaring sound of a gusher



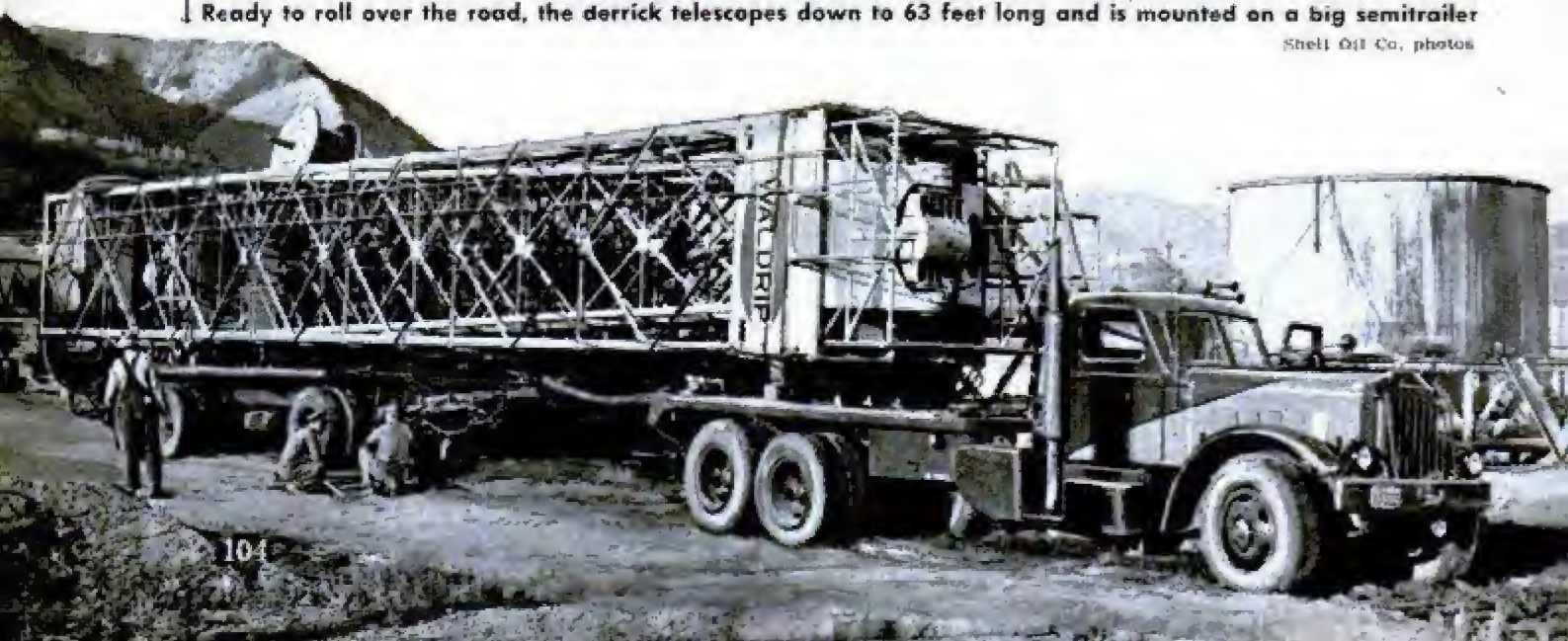
TELESCOPING DRILL RIG

Capable of boring two miles into the earth, an electric drill rig for oil wells can be telescoped and hauled away by truck when the job is completed. Erecting the huge derrick and its power and control equipment takes less than a day. Hydraulic rams raise the telescoped derrick (above) into vertical position after which the derrick is quickly extended to its full height



↓ Ready to roll over the road, the derrick telescopes down to 63 feet long and is mounted on a big semitrailer

Shell Oil Co. photos



Skim-Milk Processor

Skim milk can be reduced for marketing to 25 percent of its volume by low-cost machinery developed for the former U. S. War Production Board. Much skim milk at present is fed to livestock or wasted because it is too bulky to transport to markets. In the new machine, rapidly revolving disks agitate the milk while a stream of hot air evaporates the water content. The result is a highly condensed skim milk which can be further processed into a milk powder. The powder is as soluble as commercial dried milk and is acceptable in taste.

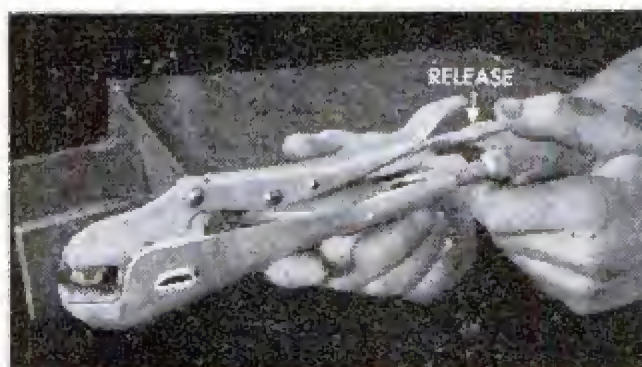
Salty Flavoring

People on a salt-restricted diet now can have the flavor of salt by using a chemical substitute. Such people, called "hydrated individuals" by the medical profession, have tissues that store abnormal quantities of water. They are susceptible to cardiac and other diseases unless they stay on a diet of restricted salt and fluids. Designed to meet their flavor requirements, the new product contains no sodium, yet it has a salty taste, flows freely and is used in the same manner as salt. Called Neocurtasal, it will be sold in drugstores.



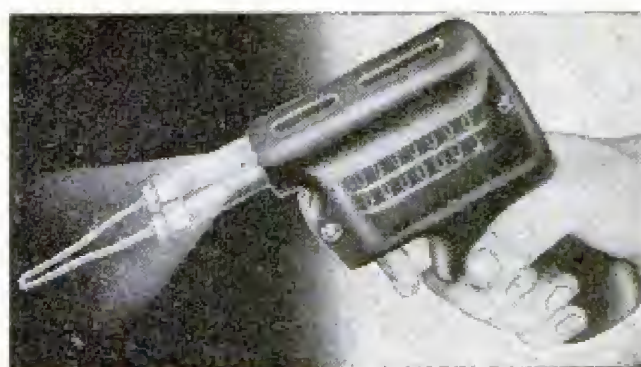
Radiophone on Motorcycle Aids Traffic Police

Three-wheeled police motorcycles equipped with two-way FM radiotelephones are in constant communication with traffic-control headquarters. Designed for use in congested urban areas, the radiotelephone receives and transmits without interference from trolleys, power lines or street lights. The radio weighs only 27 pounds and is mounted in the trunk. It has a range of 15 miles or more.



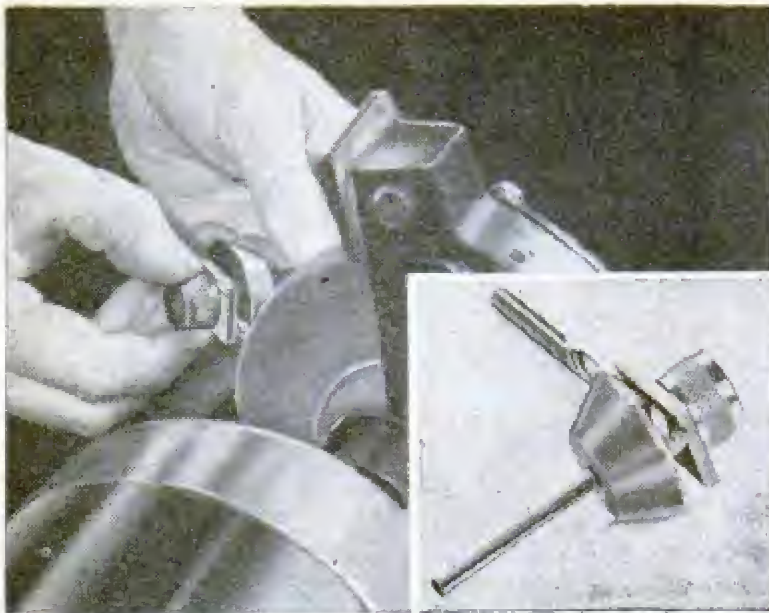
Trip Lever Releases Lock Wrench

Pushing down on a lever easily releases a lock wrench with a 1000-pound grip. The lever is located just below the pivoting handle and unlocks the wrench by spreading the jaws slightly. The forged-steel jaws have a maximum opening of $1\frac{1}{4}$ inches and are adjusted by a screw in the handle. The release permits the wrench to be used in places where some other wrenches would be difficult to unlock.



Soldering Gun Spotlights Work

Soldering in dark, hard-to-reach places is simplified by a light beamed at the tip of the gun. The "spot" is between the terminals of the loop tip and lights when current is turned on for the five-second heating period. The gun has a built-in transformer and can be used on 110-volt, 60-cycle a.c. A two-heat trigger switch turns on either normal 100-watt heat or 135-watt heat for short periods.

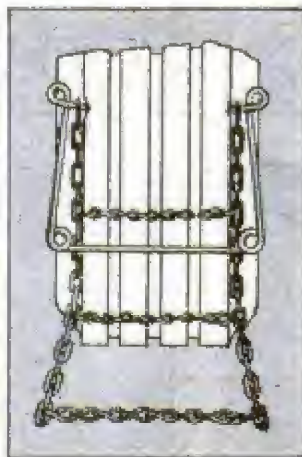
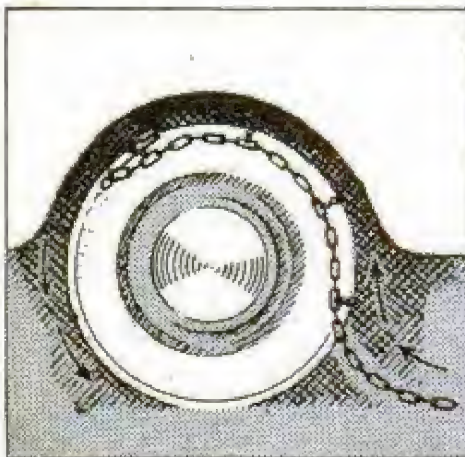
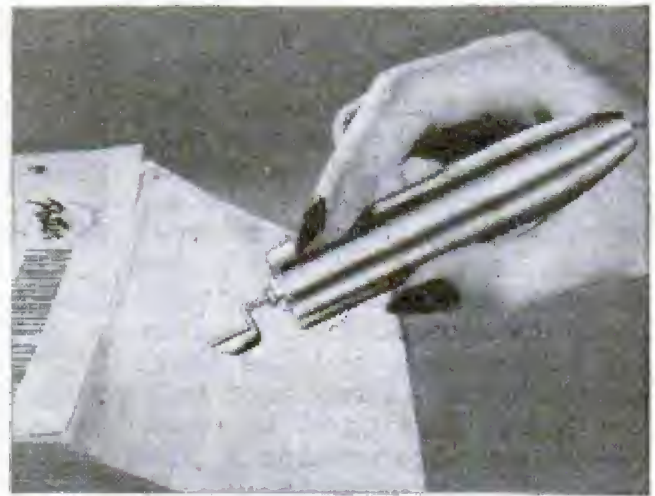


Cone Holds Drills at Angle For Grinding and Honing

Small twist drills are accurately ground and honed with the aid of a holder which keeps the drill at the correct angle to the face of the stone. The holder has a hardened steel cone, a holding plate and an adjusting knob. The drill is inserted in a groove between the cone and the plate and clamped in position. Then the cone, which is at a 59-degree angle, is held parallel with the side or face of the grindstone until the cutting edge is sharp. The holder accommodates drills from Nos. 1 to 60 in size.

"Walking" Stylus Counts Papers

Stacks of paper, cards or envelopes are counted by an electronic stylus that records the total number on an indicator. The stack is riffled to provide a steplike edge and the end of the stylus is "walked" down these steps. Each step generates an impulse which is recorded on the indicator. The stylus may be moved at any desired speed, permitting a single stack to be counted and then checked several times within a few seconds. By moving the stylus slowly, the operator can count off any given number of sheets.



Putting on Chains? Here's an Easy Way

Putting on tire chains, usually an annoying task, is simplified by a pair of wire clips that makes it possible to install both rear chains at once. The clips are clamped to the tires by spring action. With the chains stretched behind the wheels, their connecting links are hooked on the clips and the car driven forward pulling the chains around the wheels.

Curved Tool Holder for Lathes

Designed to fit all lathes with one-inch tool posts, a versatile tool holder can be used for sharpening tool bits, using a boring bar and other operations. Because of its curved shape the holder enables the operator to turn the edge of any disk up to full lathe capacity. A sturdy clamp holds the tool steady without chatter. Especially useful in small workshops where lathes are used for many operations, it can be used to hold a table for a sanding disk and for edge-grooving of V-pulleys.



BRIGHT as a new necktie but not half so loud, No. 500 is the Chesapeake & Ohio's soft and potent answer to the Diesel.

Just out of the laboratory and fresh from a triumphal tour, she has begun a stint of hard labor that may mark a revolution in railway power. For there is nothing like her on American rails—a coal-burning steam engine whose spinning turbine wheels deliver 4,000,000 watts of electric power to 16 drive wheels.

Trackside watchers gape in wonder as the million-pound monster, with a wisp of steam but no strident chug-chug, with a whir of generators but no roar of Diesel engines, responds to the green light and throttle in swift and quiet acceleration.

Snaking its burden of freight through the yards, the 500 toots a polite "hello" to an ancient switch engine puffing by on the adjacent track.

The engineer holds the reins on the turbine that spins the 500's four generators

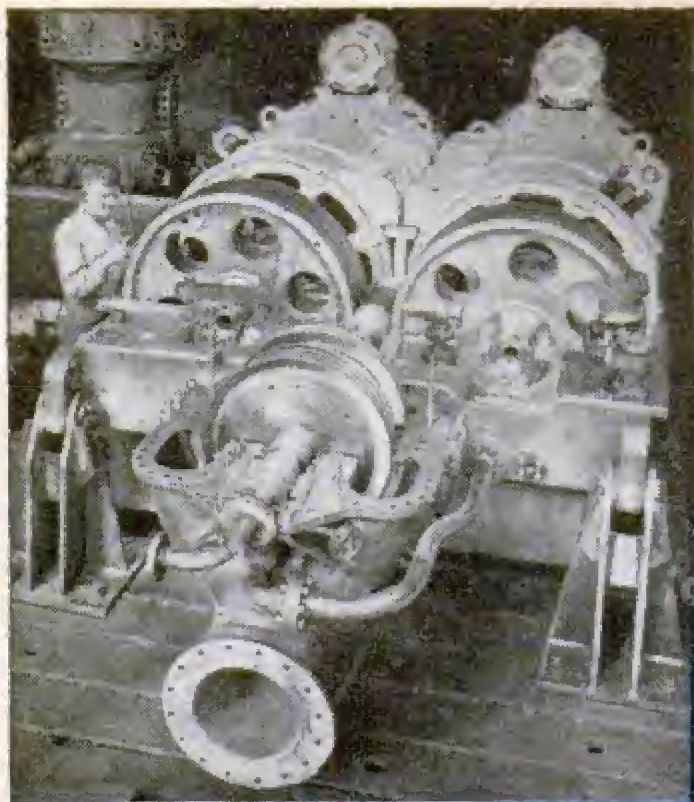


“CHESSIE” Has That New Look

By Arthur R. Railton

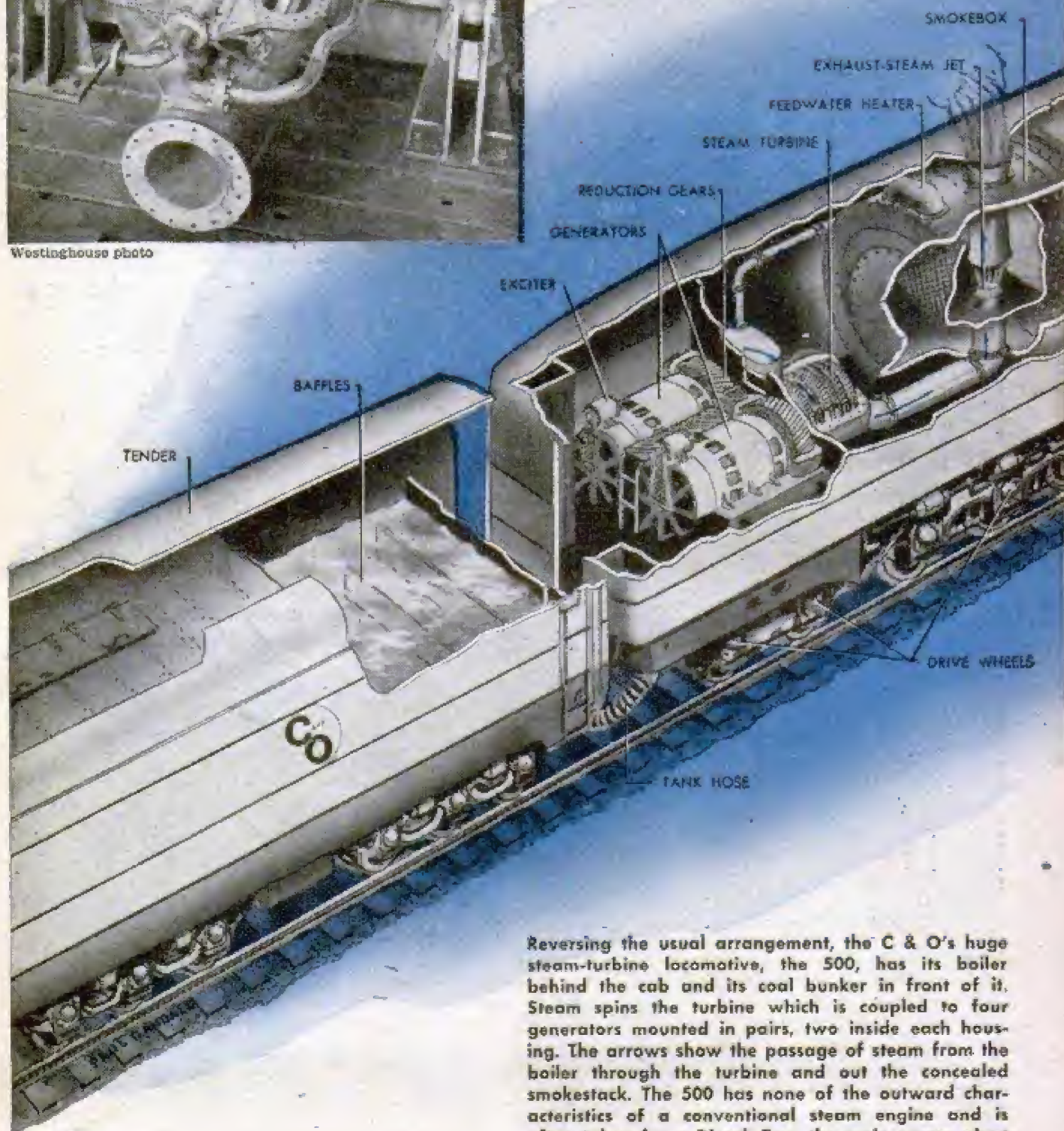
Gone is the chug that was music to Casey Jones as No. 500, first steam turbine-electric locomotive, moves into the Chesapeake & Ohio's main line



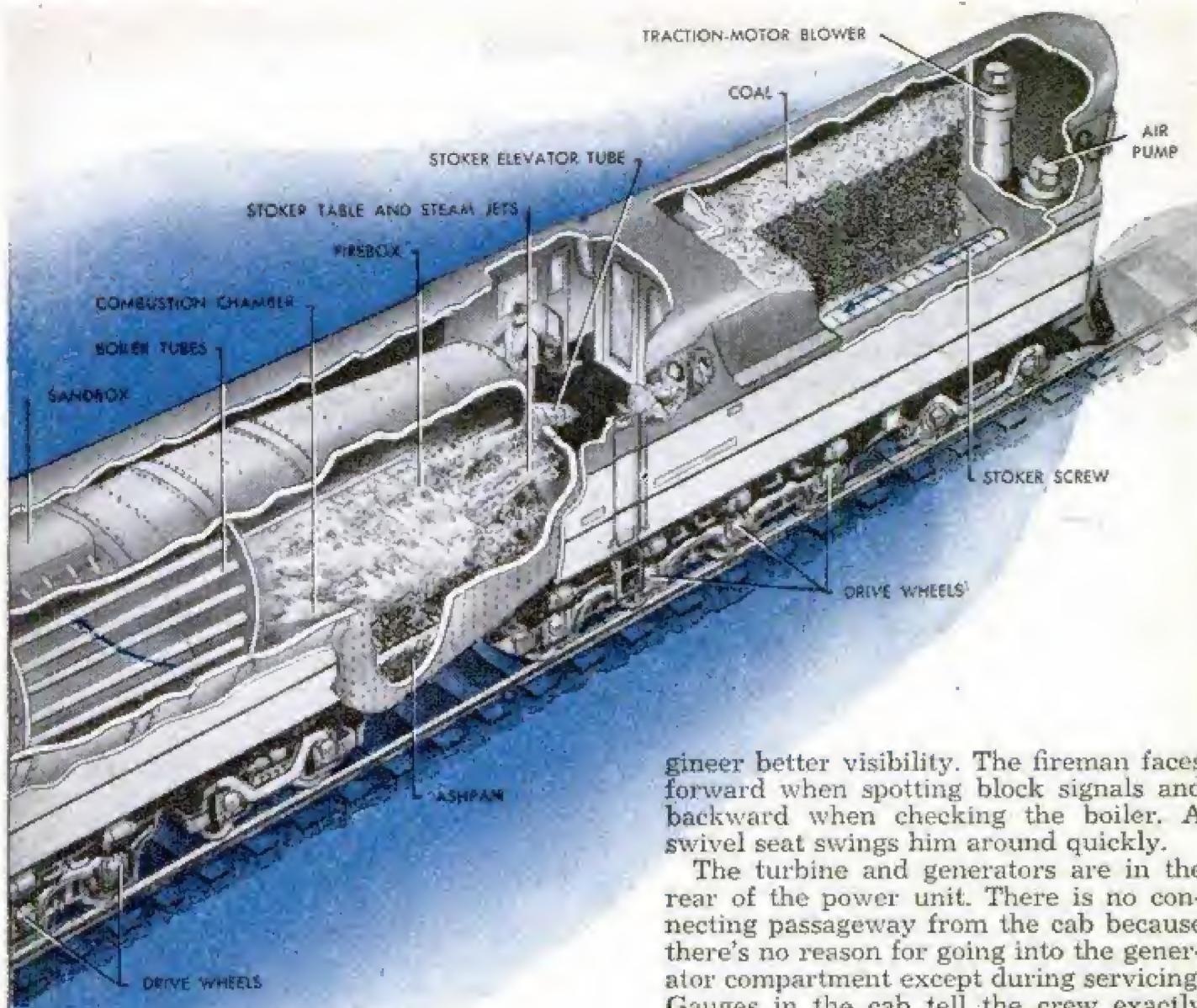


Westinghouse photo

It is the younger generation's salute to the veteran. Like the oldster in overalls, the orange and aluminum 500 is a coal-burning steam engine, but there the similarity ends. The new "baby" with its 29¼-ton coal bunker in front and its boiler and generators behind the cab represents the Chesapeake & Ohio's determination to bring the coal-burning iron horse up to date with the advantage of the electric drive; and to meet the efficiency of Diesel-electric challengers while side-stepping the threatened shortage of fuel oil.



Reversing the usual arrangement, the C & O's huge steam-turbine locomotive, the 500, has its boiler behind the cab and its coal bunker in front of it. Steam spins the turbine which is coupled to four generators mounted in pairs, two inside each housing. The arrows show the passage of steam from the boiler through the turbine and out the concealed smokestack. The 500 has none of the outward characteristics of a conventional steam engine and is often taken for a Diesel. Top, the main power plant before installation. Top housings for turbine and reduction gears are not yet in place. Generators are in the rear. Large pipe is the turbine exhaust



The C & O is, first of all, one of the leading coal-handling railroads and naturally favors coal as fuel. Second, its engineers point out that our oil reserves may suffice for only 25 to 30 years at present consumption, while our coal reserves are good for 2000 years. So they set about designing a locomotive that was as easy to maintain as a Diesel, as streamlined, as clean and quiet, and with high availability; but one that burned coal. Their answer is the 500.

There's a logical explanation for the reverse arrangement of the 500. The boiler had to be located where it would be adjacent to both the coal supply and the turbine. So, quite logically, it was placed between them. Coal feeds into the firebox by stoker from the front and steam roars out the rear end into the turbine. The boiler, a conventional fire-tube type, is mounted backwards. The firebox is toward the front and the smokestack toward the rear.

With this unusual design the cab could be moved farther forward giving the en-

gineer better visibility. The fireman faces forward when spotting block signals and backward when checking the boiler. A swivel seat swings him around quickly.

The turbine and generators are in the rear of the power unit. There is no connecting passageway from the cab because there's no reason for going into the generator compartment except during servicing. Gauges in the cab tell the crew exactly what is happening back there and adjustments can be made by cab controls.

Behind the power unit is the water tender—a mighty car in itself, holding 25,000 gallons of water. Two flexible water pipes connect it to the boiler.

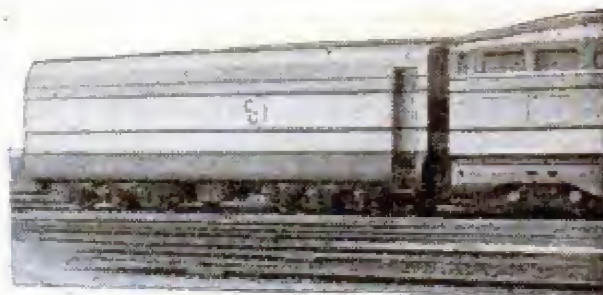
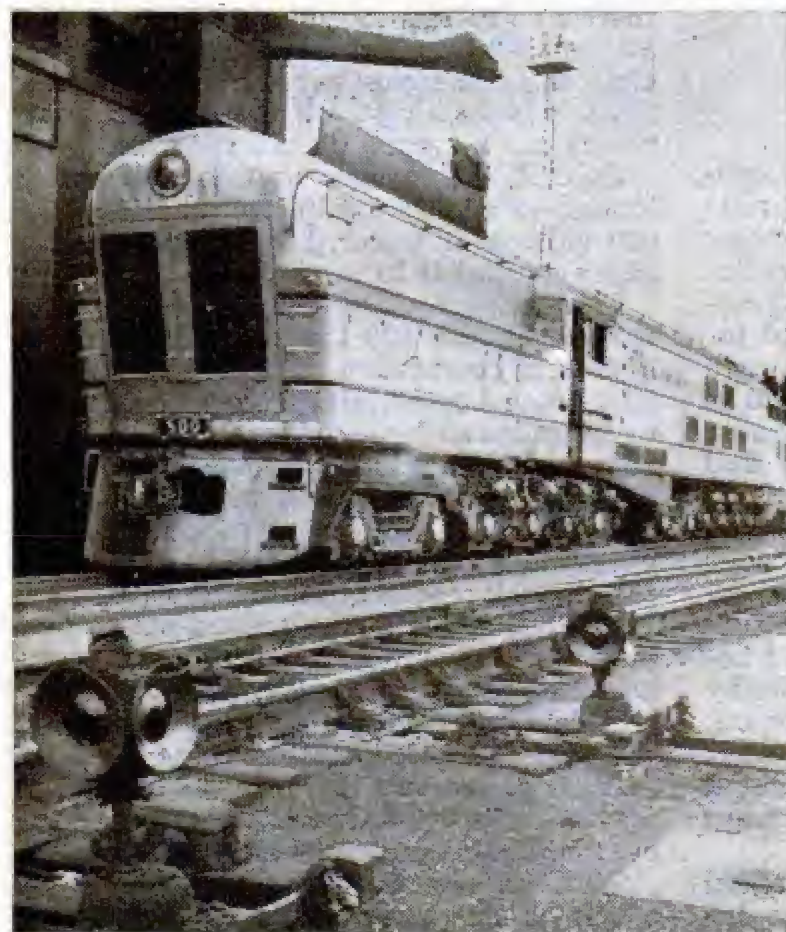
The longest single-unit locomotive in the world, the 500 measures 154 feet $\frac{3}{4}$ inch from cowcatcher to rear coupler. This iron "race horse" is capable of speeds up to 100 miles an hour. At least that's its rated speed, but nobody knows how fast it will go. With 16 driving wheels powered by eight traction motors producing 4960 horsepower, the streamlined beauty won't take a back seat to anything on rails.

The 500 is really the second steam-turbine locomotive to go to work in this country. The first was the Pennsylvania's direct-drive steam turbine. But the 500 is the first steam locomotive using turbine-driven generators to provide electrical power for its drive wheels. It is steam's answer to Diesel and coal's answer to oil.

With its electric drive, controlling the 500 is as simple as regulating an electric



Above, the fireman opens the butterfly door of the firebox to show how stoker feeds coal onto table. Steam jets spread coal over fire automatically. Three holes in stoker tube enable him to watch flow of coal when door is closed. Below, loading arm is lowered into opened bunker during coaling at Clifton Forge



fan. The single throttle lever has 11 settings from idling to full speed. The 500 cruises along easily at 70 miles an hour with the throttle on the seventh notch.

In addition to regulating the electrical field of the generators, the throttle also controls the number of jets used in the turbine. At idling, steam is forced against the blades through only one jet. At full speed and power, four jets are used. Intermediate speeds use two or three jets.

Not only does electric drive provide better control over power, but it also eliminates heavy, complex gears. The only gears in the driving assembly are the gear coupling of the turbine to the generators and the coupling of the eight traction motors to the axles. If the turbine were coupled directly to the drive wheels, as in direct-drive turbines, a huge gear assembly would be necessary. Also, it would require a variable-speed turbine that is less efficient than the turbine of the 500 that runs at a constant speed of 6000 r.p.m. Only when the load is extremely light or when the engine is idling does the turbine revolve at reduced speed.

The 500 can be run in reverse simply by changing its electrical circuits. By moving a lever on the control box next to his seat, the engineer can run the train just as fast in reverse as in forward speed. On the Pennsylvania direct-drive turbine, a separate, smaller turbine is used to provide reverse motion at slow speeds.

Riding in the cab of the 500 you are amazed at the difference between its action and that of a conventional reciprocal-action locomotive. When the engineer pulls back the throttle there is no deafening chug-chug. There's no



Top, the 154-foot "Chessie" sets a new style in steam engines. Forty wheels are needed to support its tremendous weight

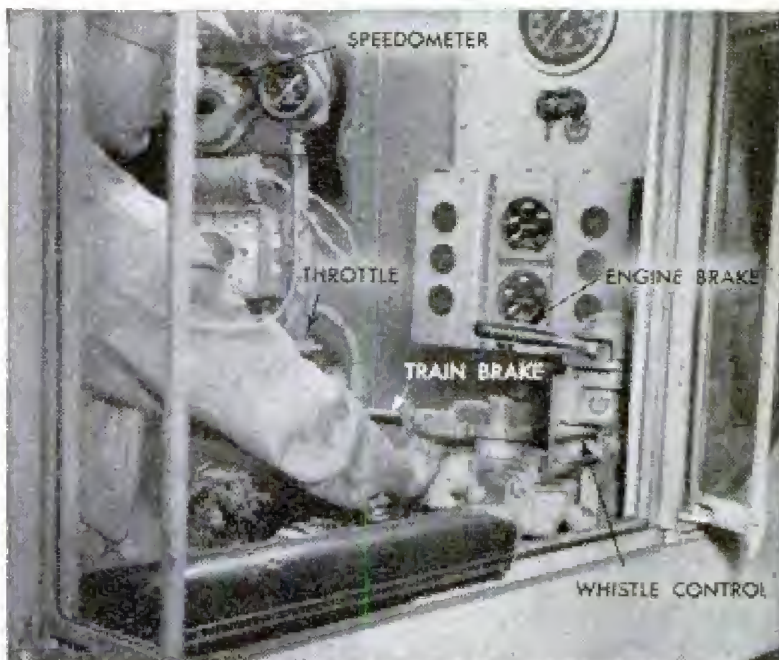
hissing of exhaust steam from the cylinders—there are no cylinders! The turbine transforms the 310-pound steam pressure into mechanical power without the clatter of valves and pistons. No black smoke billows from the stack. Instead, a smooth flow of steam from the turbine shoots into the air and disappears.

As the 500 rolls through the yards, other locomotives appear small and old-fashioned beside this shiny, streamlined beauty that may revolutionize fast passenger service. Here is a steam locomotive that doesn't need frequent trips to the shops for servicing. It will make the 666-mile run from Washington, D. C., to Cincinnati, Ohio, at high speeds without relief—and could turn around and make the return trip without servicing.

Passing the yard limit, you move out on the main line. The speed limit here is 75 miles an hour and the signal board ahead shows green over red—"clear track"; the engineer pulls the throttle back another few notches. Instantly you feel the 500 pick up speed as the 16 drive wheels respond to the increased power.

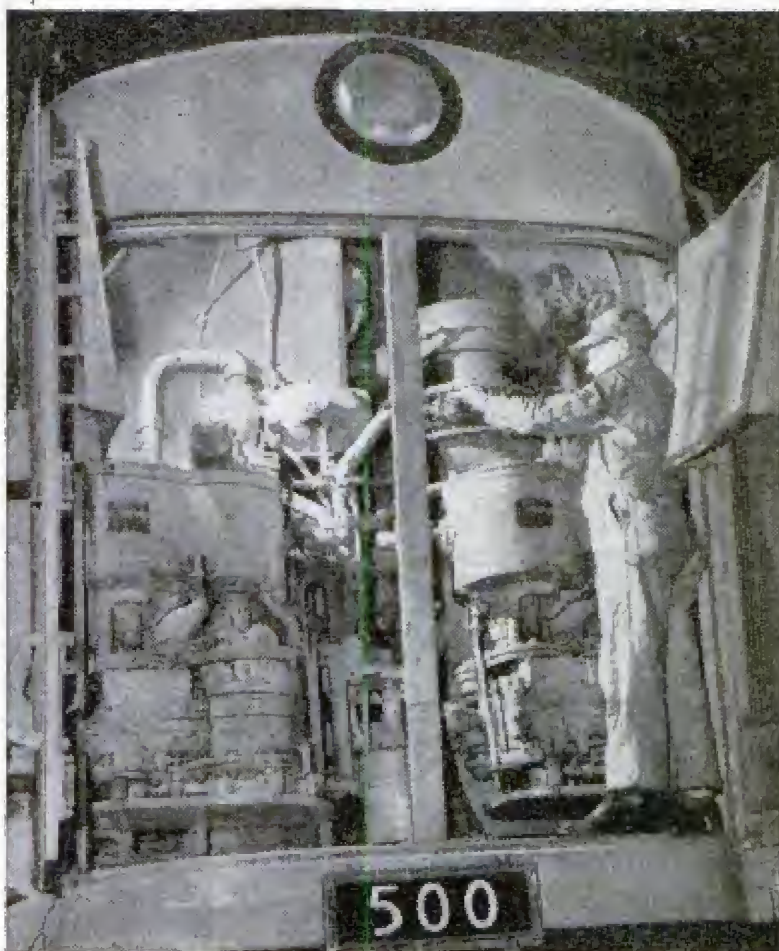
The only noise is the continuous hiss of the stoker jets blasting coal into the fire. The pulverized coal flows continuously from the bunker ahead of the cab through a stoker tube and into the firebox. Looking through three small holes in the stoker tube you see coal pouring over the lip onto the stoker table in a continuous stream like a waterfall going uphill. From the table, coal is spread over the 14-foot firebox by powerful steam jets.

(Continued to page 252)



↑ Looking at the engineer's control board from outside the cab

↓ Motor blower and air pumps are located above the cowcatcher



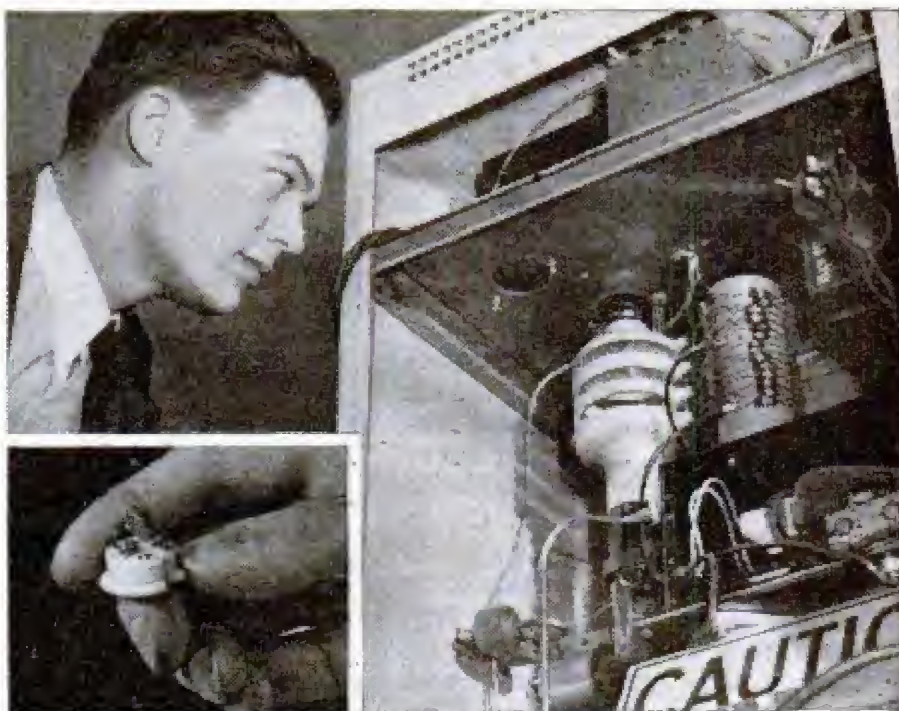


Farmer Builds Light Truck For Price of Engine

When a light truck was needed on his farm, George Samuelson of Chesterton, Ind., built one from old parts he found around the neighborhood. Samuelson's sole investment was for an engine to power the truck. The rear end is from a Ford Model-A car and the front end from a Model-T. Two V-belts connect the engine with the driving mechanism. The truck can travel forward and in reverse and makes 30 miles an hour. The sides of the platform are hinged and can be folded down.

Diamond "Insulators" Multiply Current

Important new types of electron tubes that do not exist today may be developed as a result of a new method of controlling the flow and amplification of electric current. At the Bell Telephone Laboratories scientists have discovered that when a beam of electrons is shot at a diamond chip, electric currents are produced in the chip which are several hundred times as strong as the original beam. Diamond chips are classed as an insulator because ordinarily they will not carry a current. Yet when they are bombarded with relatively lightweight electrons they multiply the original current as much as 500 times. In preparing the chips for such amplification the scientists deposit gold on



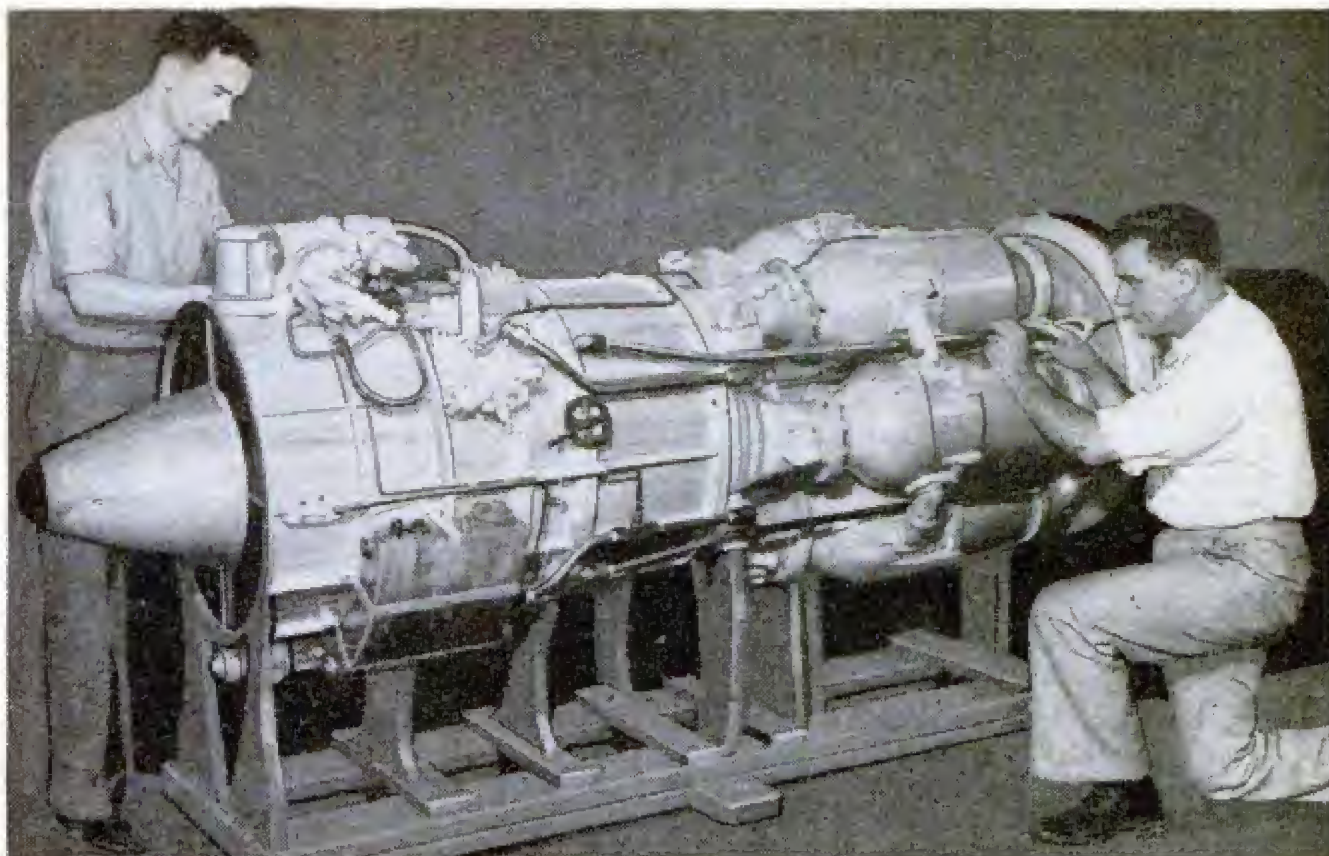
the two flat surfaces to afford electrical connections. The technique opens up a new approach to the design of electron tubes and may be a tool for studying the impact of electrons on matter.



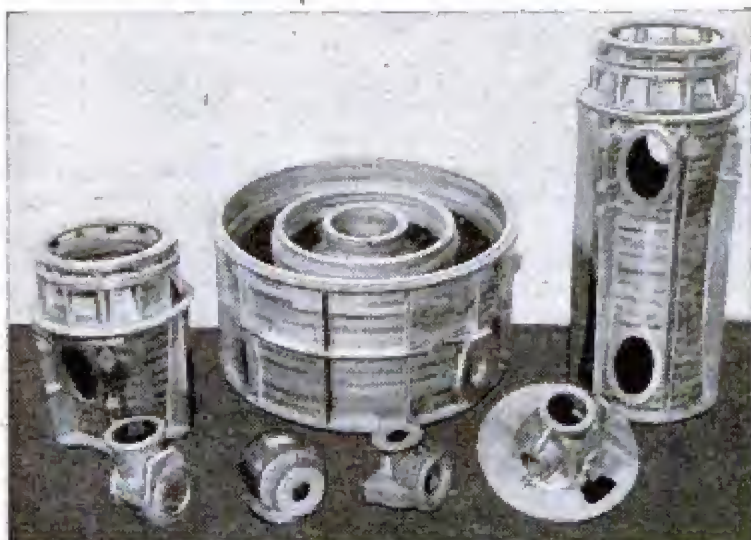
Fender Bender

Dented fenders are rolled smooth by a tool that requires no hammering. The tool consists of a C-shaped pipe with a roller on one end and an adjustable backing plate on the other. The roller is fitted behind the dent and the plate on the outside. Manipulation rolls out the dents to renew the fender in as little as 12 minutes. No other tools are required.

Information, including manufacturers' names, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.



Looking just like the real thing, a pine and mahogany mock-up (above) of Canada's first jet engine. Below, wooden parts



Wooden Jet Mockups

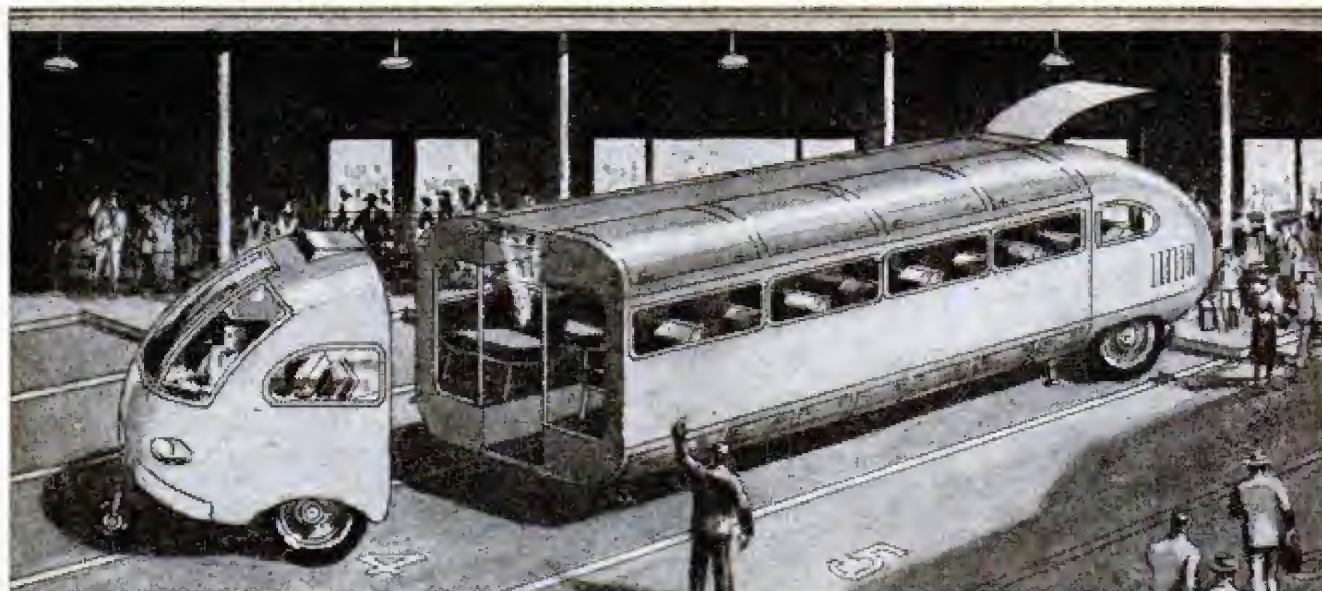
Canadians are saving time and money by making jet-engine mock-ups of pine, mahogany and cherry wood instead of metal. From blueprints, woodworkers make full-scale patterns of every component part and accessory, except piping, on proposed engines. Completed assemblies are then inspected by designers and engineers for possible changes. Shortcomings or design improvements are more easily spotted with the aid of the three-dimensional mockups than with blueprints alone. After approval, the patterns help foundrymen in casting parts for the actual engine.

Plastic Rod Checks Bearings

Bearing clearances of engines are checked by a plastic gauge which is flattened inside the bearing. The gauge is a length of extruded plastic packaged in an envelope printed with a scale. The plastic is laid on the bearing shell and then flattened by tightening the bearing cap on the crank. When the cap is removed, the width of the flattened plastic is measured with the printed scale on the envelope to determine the clearance.

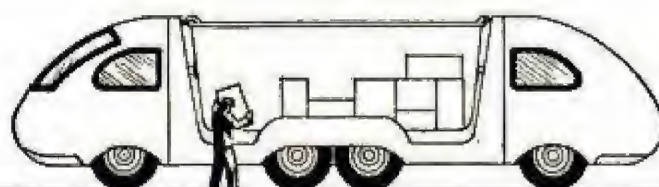
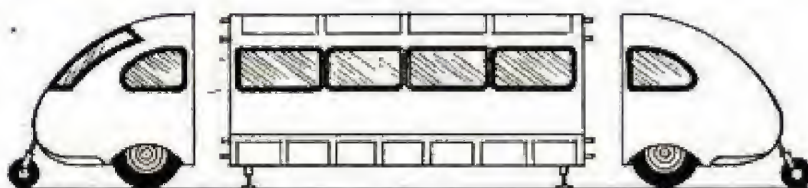
¶ The year 1887 saw the largest growth in American railroad history with 13,081 miles of new lines completed.





SECTIONAL BUSES

Buses built in sections with the carrying unit independent of the front and rear ends have been patented by Rene Lucien of England. The design includes a forward section containing the driver's compartment, a rear section containing the engine and driving wheels, and a center compartment without wheels which has seats for passengers. The three sections, fastened together by joints at the ends, are taken apart easily. The front and rear sections drop retractable third wheels to give them support and are wheeled away from the carrying compartment which is kept at the proper height by hy-



Top, driver's cab is backed into position and locked to body of the bus. Diagrams show how body stands on independent legs and how additional wheels support the center section for use as truck

draulic jacks. The design permits quick power-unit changes and the shifting of end sections from short to long passenger sections as traffic demands.



Cartridge-Type Gun For Home Calking

Loading a new, lightweight calking gun is easier than changing blades in a safety razor. You merely snap the loaded cartridge in the gun just as it comes from the store. The cartridge has a nozzle on one end and an opening for the ratchet-operated piston on the other end. The piston moves forward one eighth of an inch each time the trigger is pulled forcing the calking compound out evenly. Ideal for minor repairs around the house, the gun and disposable cartridge eliminate the cleaning of conventional guns.

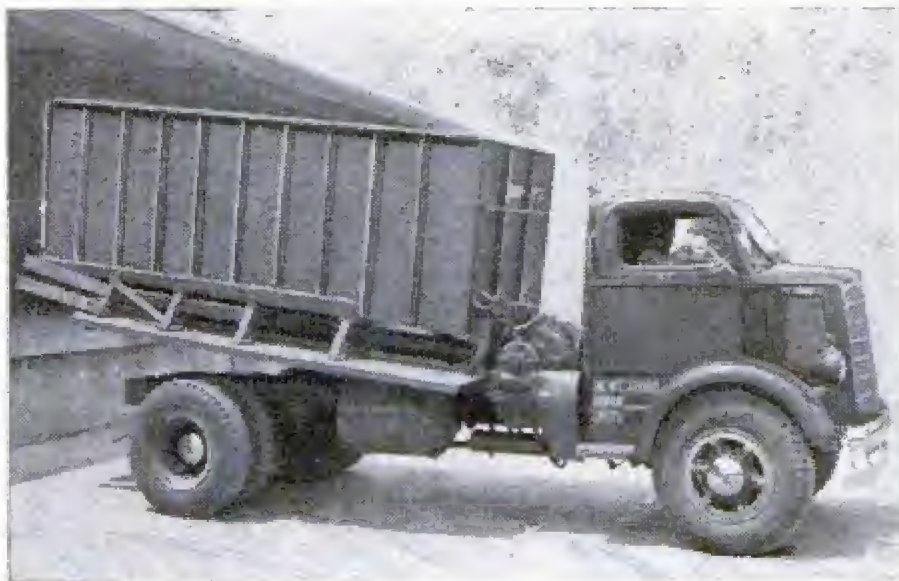
While 154 miles of new railway lines were built in 1947, 670 miles of trackage were abandoned.

Jeep-Trailer Truck Can Turn on "Dime"

Combining a surplus American Army jeep and a trailer, Italian mechanics have built a six-wheel truck which can turn on the proverbial "dime." The hindmost wheels are turned at the same degree as the front wheels by the action of a single steering wheel. A rod connects the trailer's wheels to the plate on which the trailer rests on the jeep. The plate turns as the jeep turns, causing the trailer wheels to



turn in the same direction and at the same degree. The front and hindmost wheels turn in opposite directions when the vehicle is backed up.



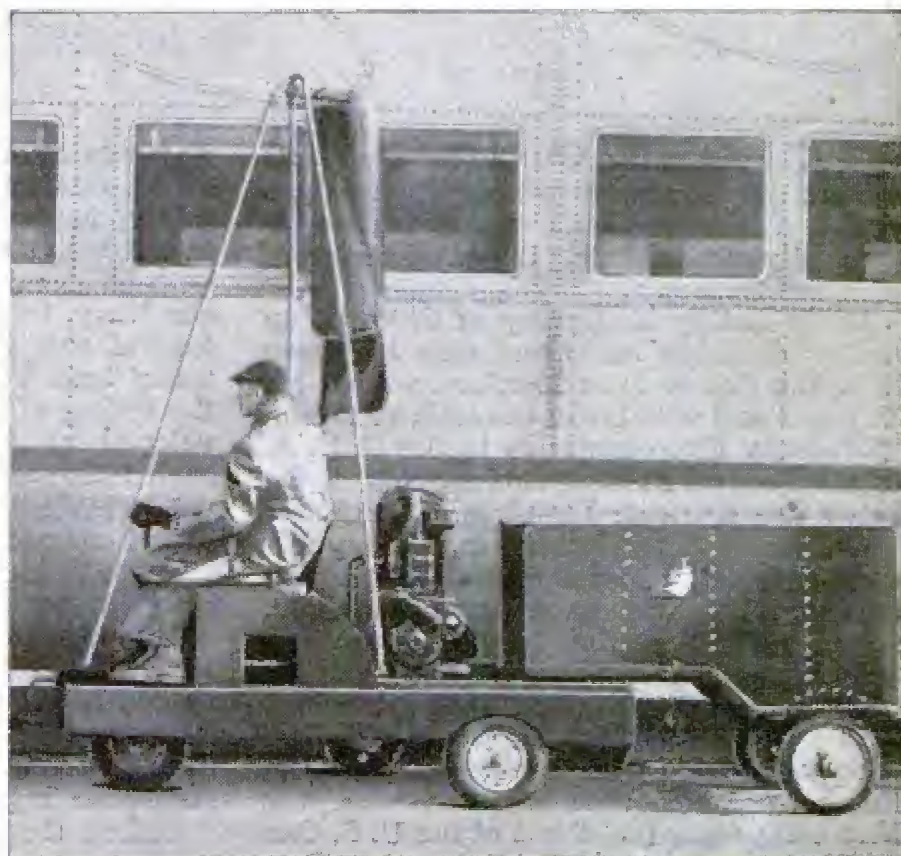
Quick-Loaded Body Rolls Off Truck

Truck bodies on casters slide completely off the truck to save time in loading and unloading. The bodies are shaped like large freight boxes and are rolled on or off the truck by a rear-mounted winch. A hydraulic hoist elevates the steel track to clear loading docks. While the truck is in motion the body is locked in place by a safety catch.

Mobile Scrub Cart Cleans Train Panes

Windows of railway cars are scrubbed by a mobile washing machine at the Pocatello, Idaho, station of the Union Pacific Railroad. Operated by one man, the washer sprays ordinary tap water on the windows and scrubs them with a revolving brush. The machine is fast enough to scoot down one side of a 12-car train and back up the other in eight minutes, washing every window on the way. Thirty gallons of water are used on a 12-car train.

☐ In daylight, the human eyes can distinguish more than 17,000 different colors and tints.





Copyright by Juan Guzman



One of nature's most colorful beauties, a fighting sailfin, left, is being boated. Above, fishing center at Guaymas, easily reached from Arizona by auto or train

Pemex photo

Deep Sea Rodeo

SOUTH of the Rio Grande, where saints are almost as numerous as generals, a genial American business executive is generally recognized as the patron saint of Mexican fishing.

He is LeRoy H. Dorsey of Chicago, an ardent deep-sea fisherman who has been handling hot reels in Mexican waters for 14 years and who bears the unique title of "Honorary Representative in the U. S. A. of the Federal Fishing Commission of the Navy Department, Republic of Mexico."

Originally a fly fisherman, Dorsey became interested in deep-sea fishing in the middle 1930s. He gave away his light, stream-fishing equipment and acquired salt-water tackle. Then he deserted the trout streams and began to explore the blue salt water of the Mexican coast.

South of the border Dorsey felt the need for better understanding between the Mexican people and those of the U. S. One

way this could be brought about, he reasoned, was through international deep-sea fishing rodeos. With world unrest growing, it was suggested and he organized—with cooperation of officials of the Mexican Navy, the Minister of Interior and the federal tourist department—the first International Tarpon Rodeo at Tampico in the spring of 1941. Later, others were developed at Acapulco and Veracruz. At each rodeo, a solid silver cup, put up by the president of Mexico, is awarded the grand champion.

Several hundred American sportsmen compete yearly in these fishing rodeos, conducted under the auspices of local fishing clubs. Some cruise south in their own fishing boats. Others fly down on the four American airlines that serve Mexico. Still others drive their cars over the Pan-American highway or come by train.

Before the war, the average American



Patron saint of Mexican fishing is LeRoy H. Dorsey of Chicago. To aid better understanding between U. S. and Mexico, he helped in organizing first international fishing meets. He caught this 105½-pound sailfish

angler automatically linked the phrase "good fishing" with Canada's lakes and streams. Today, more and more rod-and-reel enthusiasts are thinking in terms of Mexico and 5400 miles of tropical coastline—the fishing rodeos, for example.

Tampico, scene of the Seventh International Tarpon Rodeo, March 18, 19 and 20, was settled by the Huastecan Indians in 713. Today it lies in the heart of Mexico's great petroleum-producing area along the Gulf, and from its wharves and docks are shipped thousands of barrels of oil to all parts of the world.

Tampico is at the mouth of the Panuco River where the giant tarpon, Silver King, world's largest specimen of this gamy fighting fish, was hooked a few years ago. In addition, there is an abundance of sea bass, red snapper, red grouper, pompano and shark. Down the coast is a salt-water lagoon, Tamiahua, which



Marlin abound in most of the popular Mexican fishing waters

extends for about 50 miles and offers excellent robalo (snook) fishing.

Acapulco, where the Fifth Annual Sailfish Rodeo will be held April 1, 2 and 3, is Mexico's largest Pacific port. From here in the 16th and 17th centuries, Spanish galleons sailed to China and the Philippines

and returned laden with ivory, porcelains, perfumes, jades, silks and spices. Today it is popular as a winter vacation resort.

One of the first fishermen from the United States to discover Mexico's Pacific waters was Zane Grey, famous novelist and sportsman. Some 20 years ago, after fishing off Acapulco, he wrote:

"When at last we got my fish on board it appeared that I had reason to be proud. All the delicate and exquisite features so remarkable in the other sailfish we had taken appeared intensified in this one. He was 10 feet 1 inch in length, weighed 135 pounds and the spread of his tail was 3 feet."

That's good fishing, but Zane Grey's prize catch of two decades ago has been surpassed on several occasions. The present record for the Pacific sailfish is 190 pounds and 10 feet 2½ inches long.

The Third International Veracruz Deep-Sea Fishing Rodeo is April 9, 10 and 11. Veracruz is 281 miles east of Mexico City on the Gulf, where Hernando Cortes

and his whiskered band of Spaniards landed in 1519 and proceeded to conquer what they called "New Spain." Today it is one of Mexico's leading ports.

Both salt and fresh-water fishing are offered here. Best deep-sea fishing is found at Villa Rica and around the banks

Below left, flag-raising ceremonies open the three-day rodeos. Right, starting after giant tarpon at Tampico



and shoals of the Verde, Anton Lizardo, Anegada de Afuera and La Gallega islands. Large tarpon, marlin, kingfish, African pompano and sea bass are taken there. Rivers near Veracruz—especially the Cazones and the Tecolutla—offer bass and rainbow-trout fishing.

No article about Mexican fishing would be complete without mention of the Gulf of California, reached easily by highway or railroad from Arizona. Marlin, sailfish, mako shark, dolphin, tuna and the giant white sea bass are found in these waters. Dangerous and exciting sport is fishing for giant manta—4000-pound rays that can swamp a boat.

Mexico's fishing rodeos are three-day affairs, starting the night before with a get-acquainted banquet for contestants and rodeo officials. This is a gala occasion, staged with the warm-hearted love of fiesta so characteristic of the Mexicans.

The next morning at nine, flag-raising ceremonies and speeches send the fishermen on their way. The contestants fish under a code as strict as Marquis of Queensberry rules. At the end of the third day, the rodeo is closed with the lowering of the flag and awarding of prizes contributed by Mexican fed-

eral, state and city officials, Mexican and American individuals and fishing-tackle companies.

Last year's prize catches were as follows:
(1) Tampico—a 6-foot 2-inch tarpon

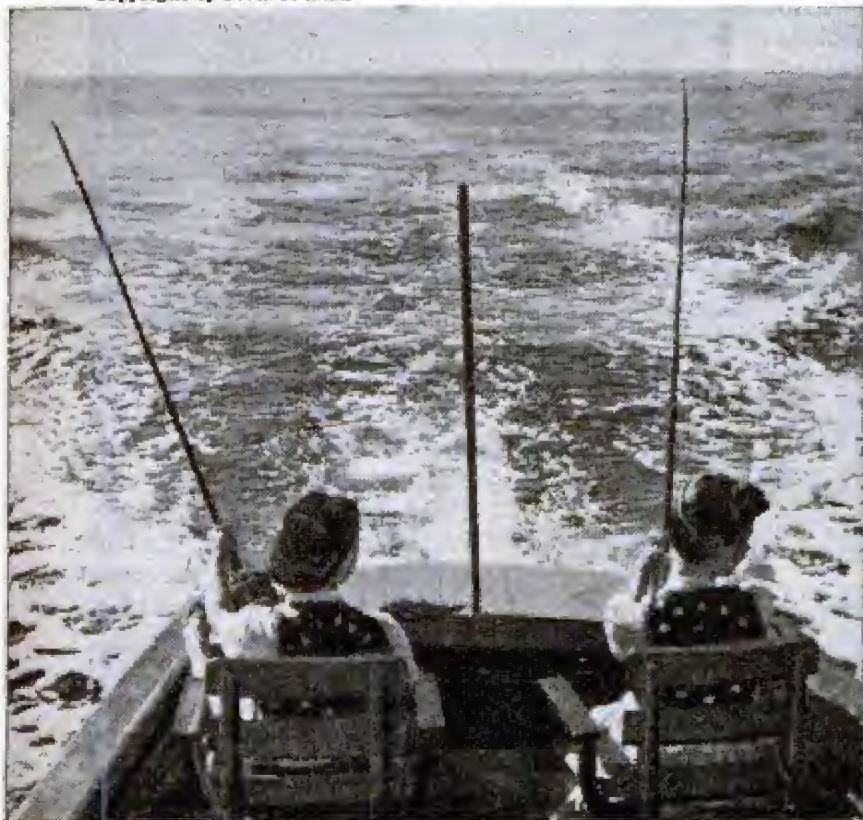
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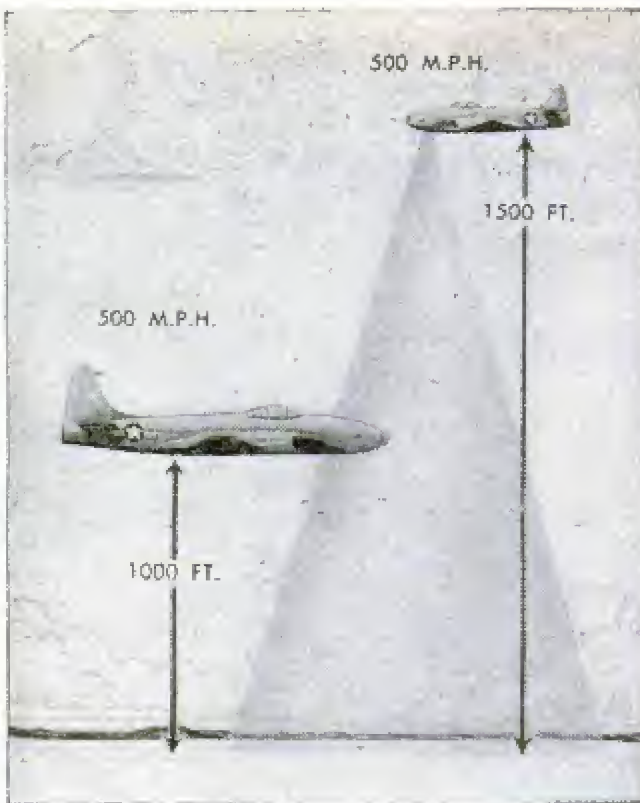
Deep-sea fishing offers unbeatable combinations of sunny skies, blue water and hungry fish. Right, the 1947 Tampico winner holding his catch, a 15½-pound tarpon 6 feet 2 inches long. They come even bigger than this



Copyright by Juan Guzman

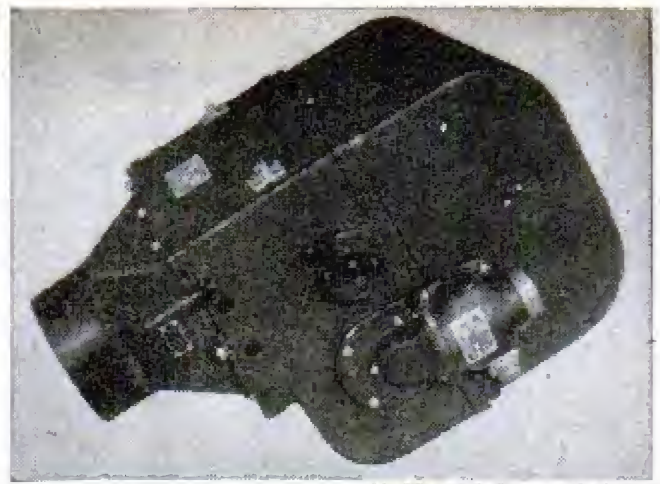
"Dorado" to the native lad who gaffed it, but a dolphin to the American sportswoman who hooked it and fought it to the boat





Recon Photos at 1000 M.P.H. Simulated by U.S. Air Force

Actual flight tests have shown the U. S. Air Force what photos taken at 1000 miles an hour and 500 feet above the target will look like. Two P-80s flew in opposite directions at 500 miles an hour, using a runway as the course marker, to simulate the future reconnaissance problem. The upper, or photographing plane, had two strip cameras with focal lengths of 6 and 24 inches. They flew at 1000 and 1500 feet altitudes, respectively, for the tests. The quality of the photos is excellent, officials said, and dimensions in the direction of flight are accurate to within two percent.

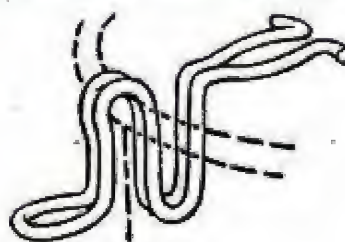
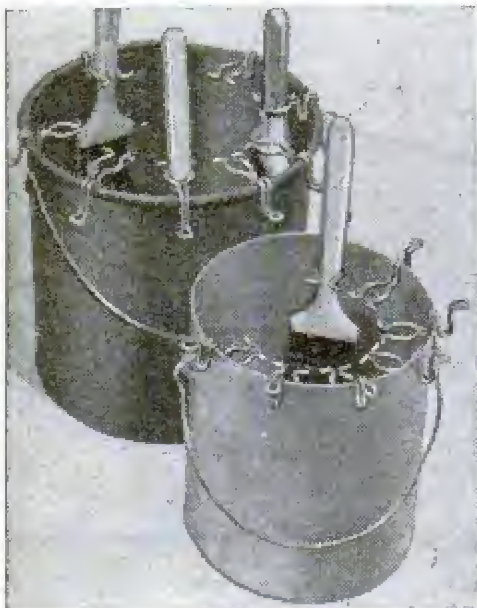


Air Materiel Command photos

To simulate conditions for taking aerial photos at 1000 miles an hour, two 500-mile-an-hour jets, left, were flown in opposite directions over the same runway so that their paths crossed. Above, high-speed strip camera, specially synchronized, used for test. Below, photo made at simulated 1000 miles an hour



Wire Clips Snap on Rim of Can to Hold Paintbrushes off Bottom



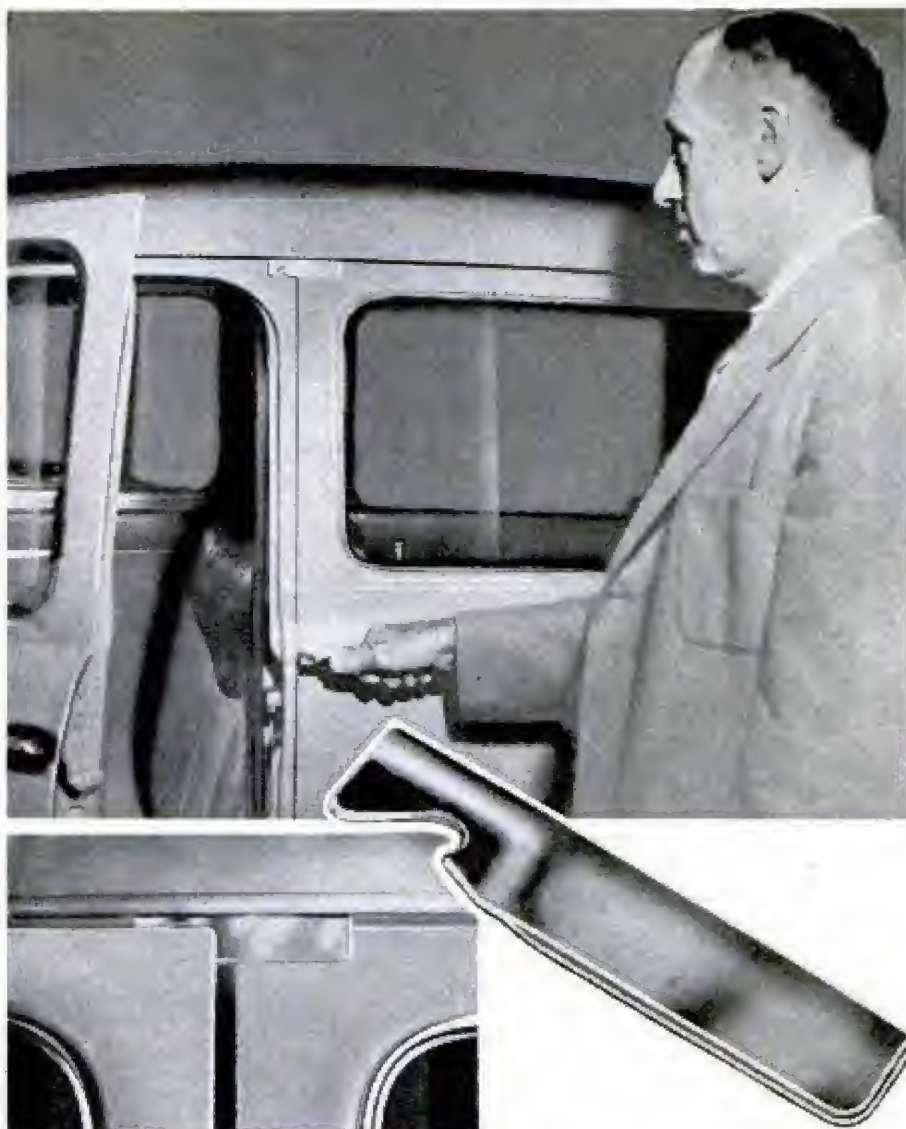
Wire clips that snap on the rim of a can hold paintbrushes safely inside the can during painting and storing. The spring clip grips the brush handle, holding the bristles away from the bottom of the can thus preventing spreading. A double bend in the clip provides a narrow slot for small cans and a wider slot for large cans. The clips can be used also for holding tools in the workshop by slipping them on a strip of wood fastened above the bench.

Slip-on Door Lock Protects Children

Automobile doors are held closed by a slip-on device that fits in place without the use of tools. It is a safeguard against children falling out when a door is accidentally opened, and doesn't require permanent attachment. One end of the lock slips over the rear door's top flange; the other fits beneath the front door's flange. The lock also serves as a bottle opener.

Baked Volcanic Ash Makes Building Blocks

Volcanic ash is converted into a building material by baking it in an oven—a process developed by A. L. Burwell of the Oklahoma Geological Survey. Great quantities of the peculiar ash were deposited across Oklahoma prairies thousands of years ago. When the ash is heated it forms a material similar to conventional building brick. The hardened blocks are filled with tiny bubbles of gas. The material has excellent insulating qualities, is soundproof and fire-



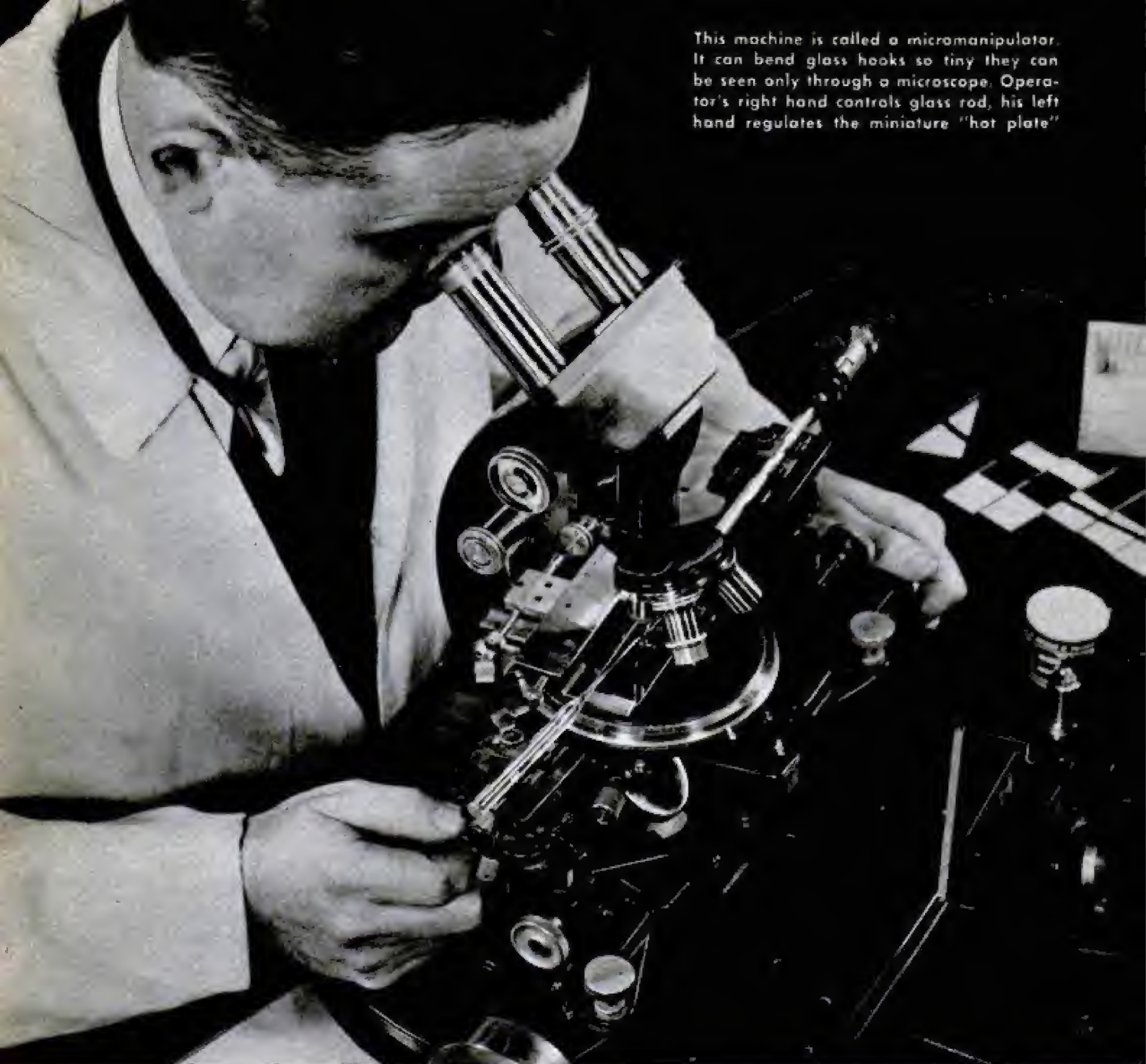
proof, floats on water and can be sawed like wood. Olive drab in color, it can also be made in slabs or strips.



Darkroom Moved Into Light

Darkrooms are moved out into the light for demonstration purposes by the use of a booth made of large sheets of "safelight" filter material. The darkroom is set up in a normally lighted room and the complete enlarging and developing process is carried out in full view of spectators. Used for demonstrating a new enlarging paper, the darkroom has transparent sides and dome. The safe-light material filters the blue, green-yellow and deep red of the spectrum and prevents fogging the enlarging paper without blocking the view from outside.

United Air Lines passengers can wire ahead for rental cars to be available on arrival at airports of 50 cities served by the company.



This machine is called a micromanipulator. It can bend glass hooks so tiny they can be seen only through a microscope. Operator's right hand controls glass rod, his left hand regulates the miniature "hot plate"

Eastman Kodak photo

Tools That Fit in a Needle's Eye

TOM THUMB tools are the "hands" of science in exploring the unknown under a microscope.

Miniature tools from soldering irons to saws are providing a means of pinning down the mysteries of science. With them scientists can puncture the "skin" and operate on one-celled animals too small to be seen with the naked eye. The tools are used in research fields from medicine to metallurgy. And size is no key to their value, for they are cracking the unknown.

The microscope gave science "eyes" for observing objects of the infinitesimal

world. Yet scientists have had difficulty probing this world without tiny hands. A new field of science called micromanipulation has given them fingers with which to operate beneath the microscope.

Scientists now can wield scalpels, needles, pipettes, knives and a score of other tiny tools ranging down to $\frac{1}{5000}$ inch in diameter. They even have a microguillotine which chops up midget capillary tubes.

The delicate tools probe scientific secrets under the guidance of a micromanipulator, an instrument bristling with pliable shafts. A slight touch of a screwhead

By Mack Taylor



Studies of specks of matter require instruments so small their working ends can't be seen without the aid of a microscope. Magnified eye of the needle is huge compared to the tiny hook on the micro-instrument at right



manipulates the tool attached to one shaft.

An amazing assortment of hooks and forks are used in a micromanipulator to help examine foreign particles. Other tools such as rakes, glass and steel knives, saws, hammers, files, chisels and scrapers come in handy for performing operations. For lifting objects, there are micro monkey wrenches, tweezers and electromagnets.

It's hard to draw a line as to just where micromanipulation begins and ends. Some scientists use the word interchangeably with micrurgy, which other authorities insist applies only to operations on germs

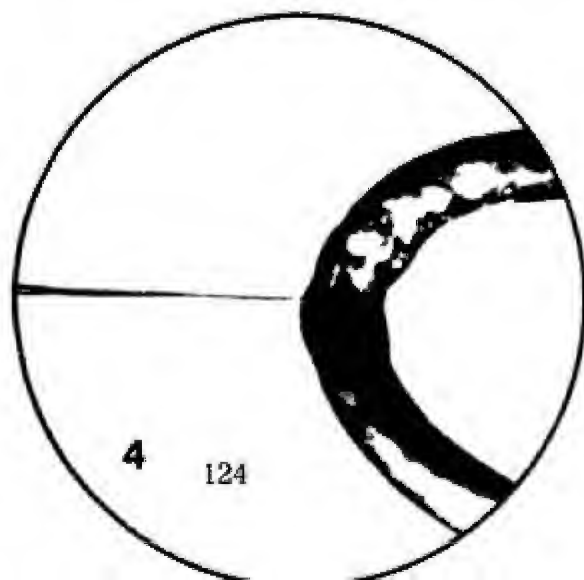
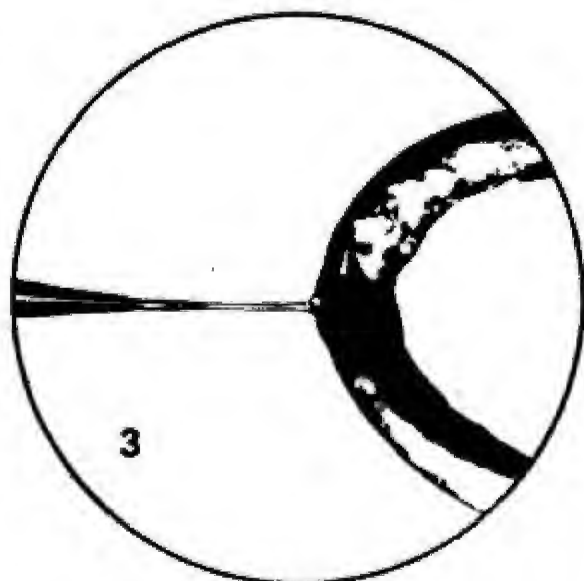
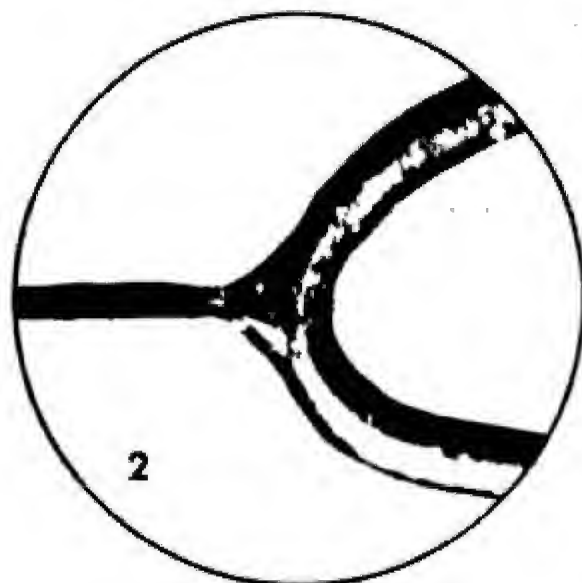
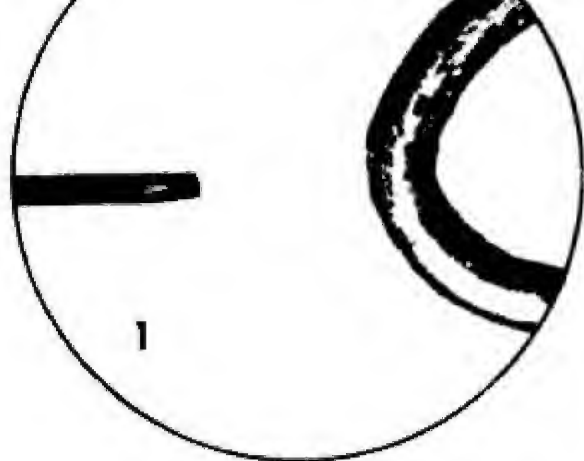
and cell tissues. Still others maintain that micromanipulation includes any work in which apparatus is moved about in making microscopic observations.

Micrurgists at New York University and other laboratories are working with their Tom Thumb tools to unlock the secrets of a tiny living cell. They have removed the nucleus of the amoeba, the tiny one-celled animal found in fresh water. They've kept the enucleated animals alive for more than 24 hours. Using micro-needles, they have injected droplets of oil into the cells to study action of enzymes, the complex

On the screen is a magnified image of capillary tube. Micrurgist is about to reach into it with tiny pipe. Right, tools include, left to right, a microburette, tweezers, heating unit, soldering iron and two dissecting needles

Fleischmann Laboratories photo





↑ Micropipette is drawn by holding tube over tiny flame and pulling glass with tweezers. Left, in making a microhook a glass rod is touched against a heated platinum wire, then drawn out much finer

chemicals our bodies manufacture to digest our food.

One micrurgist has made electrodes delicate enough to measure the potential difference between the inside and outside of a living cell, while a team has made thermocouples delicate enough to be embedded in a living cell to measure heat absorption.

All these experiments are directed toward a better understanding of protoplasm. And protoplasm lies at the heart of unanswered questions about many diseases including cancer.

Much of the micrurgist's study is an attempt to learn just how proteins are put together. Scientists would like to produce complex proteins in the laboratory for experimental purposes, but that's out of the question until more is known about their make-up. It's thought that when a virus enters a living cell it converts the protein into a substance similar to itself. Tools of micrurgy are being used in the study of the construction of these proteins.

It has been found that certain chemicals of the hydrocarbon family, derivatives of coal tar, can cause cancer in animals. One of them, benzopyrene, may be responsible for one form of cancer in man. If micrurgists can create mutations—changes in structure—within a cell that will produce cancer, they will be at the root of the puzzle of how cancer starts.

In the growing of yeast cells which "raise" our daily bread, micromanipulation is performing miniature miracles. It takes about 15 billion yeast cells to weigh a gram, and that many grown cells are about the size of two aspirin tablets. But at Fleischmann Laboratories, biologists work with tools so minute they can pick up a single cell.

So that bakers will have yeast which doesn't vary, the research is aimed at maintaining uniform quality. Part of this research involves handling very minute quantities. After putting single yeast cells in droplets of solution that will encourage their growth, the biologists can arrange rows of a dozen of the droplets on a

(Continued to page 248)



"Convertible" Mower Removes Leaves or Snow

Bernard L. Larson of Buffalo, N. Y., built himself a tricky "convertible" that will never speed along the highways. It's a gasoline-powered combination snowplow, leaf remover and lawn mower. A blower and revolving brushes pick up leaves and shoot them into an attached burlap bag. Removing the front cover and

exposing the brushes converts the machine into a snowplow. In the spring it becomes a lawn mower with the substitution of two revolving cutting disks for the blower and brushes. As further evidence of the inventor's ingenuity, the 1½-horsepower engine's flywheel is guarded by a former kitchen strainer.



Knife-Bladed Plow Chisels the Soil in 34-Foot Strips

Plowing costs are cut in half while crops are increased up to 100 percent by a 34-foot plow that chisels the soil instead of turning it over in furrows. Narrow, knife-like blades, spaced every 12 inches, crack open the subsoil permitting moisture to enter. The plow is hinged eight feet from

each end to permit simultaneous plowing of three contours. Because it does not turn the soil, the plow leaves weeds on the surface where they furnish shade and mulch and the absence of furrows reduces erosion to a minimum. Ranchers use the plow to loosen root-bound grass in pastures.

THE OLD INDIAN GAME



Johns Hopkins photo

Object: to place ball in net. **Opposition:** up to 10 armed huskies

THIS MONTH along the East Coast a growing number of small fry race for the vacant lots fondling webbed sticks—lethal weapons in a rough-and-tumble sport that is pushing baseball out of the sand lots.

The pint-sized athletes are taking after their big brothers in college, who are reviving lacrosse in a big way. Oddly, until recently only a few high schools and colleges played lacrosse, America's oldest sport. Now the slashing game is spreading west, and teams from the Middle West and West Coast will trot out on the field this year.

Noggin-knockers from Ohio State, Oberlin, UCLA, Loyola of Los Angeles, Franklin and Marshall, Dickinson, Delaware, Washington College (Md.) and William and Mary will enter competition for the first time.

Lacrosse is the only contact sport played in the spring. It's a game that blends the power of football, dash of basketball, precision of baseball and speed of hockey. As a spectator sport it's unique. Once you've seen a lacrosse game you're either a rabid fan or the game leaves you cold. Most spectators become fans; there's been a tremendous surge in game attendance within the past few years. Ten thousand "hunkers"—lacrosse fans—saw last year's open

Redmen played lacrosse long before Columbus set sail. Now sandlots and stadiums are resounding to the whack of netted sticks in a revival of this riotous sport

title match, foghorning their enthusiasm across the Johns Hopkins stadium.

If you live west of the Alleghenies you'll likely have a chance to watch your first lacrosse game soon. Zealots flatly state that it will become a major college sport, and they see

the day when professional tilts may vie with baseball in popularity. The Canadian government passed a legislative act in 1867 naming lacrosse the national sport, and hunkers see no reason why the game can't be just as popular in this country.

Despite the rough-and-tumble nature of the game, girls' schools are taking part in the revival. The first U. S. Women's Lacrosse Association was formed in 1934 after a visiting English team created a flurry of interest. Now several skirted teams are playing the unladylike sport.

Lacrosse is the original "old Indian game." It was played by the redskins long before white men discovered the continent. "Baggataway," forerunner of lacrosse, was a warlike game in which tribe was pitted against tribe, the tilt lasting several days. Sometimes 400 braves fought for the ball at a time. When a warrior picked up the ball, he popped it into his mouth and raced a half mile for the goal. Op-

posing braves beat him on the head with their sticks, and if he lagged along the way the squaws dashed onto the field to spur him with whips. The first objective of a player was to cripple his opponent, thereby cutting down the number of players on the opposing team. Occasionally a particularly rough game would explode into a full-scale tribal war.

Great feasts and powwows were held before the big match. Some tribes made a ceremony of the game itself. Attached to each player was the tail of an animal, and during the battle he was required to imitate the creature he represented.

Canadian pioneers soon picked up the game, changed the rules and adopted it as a rough frontier sport. Later it spread from Canada to Baltimore. Johns Hopkins University has played lacrosse since 1888, has won or shared 18 national intercollegiate titles and brought the international championship to the United States in 1928 and 1932, the two years the game was played at the Olympics. In 1947 Johns Hopkins' three teams played a total of 21 games, an indication of the university's enthusiasm for the sport.

Because Baltimore is the home of Johns Hopkins, it has become the unofficial national capital of the game, and back-lot teams of that city have deserted baseball for lacrosse. The sport gradually has spread along the East Coast and now is invading the West. Today about 50 colleges and 75 high schools have lacrosse teams.

But the game hasn't lost its Indian flavor. Even now, the only manufacturers of lacrosse sticks are the braves of a Canadian tribe.

Equipment worn by the players is designed to give maximum protection without hampering speed. As most of the blows



Sportfolia photo

While an attack man leaps for a pass, two opponents check—and double check—him with a pair of jarring blocks. Lacrosse is a tough sport for tough players

Ball lies between players' sticks for a face-off, which occurs at start of each quarter, after a goal and whenever ball is deadlocked between players



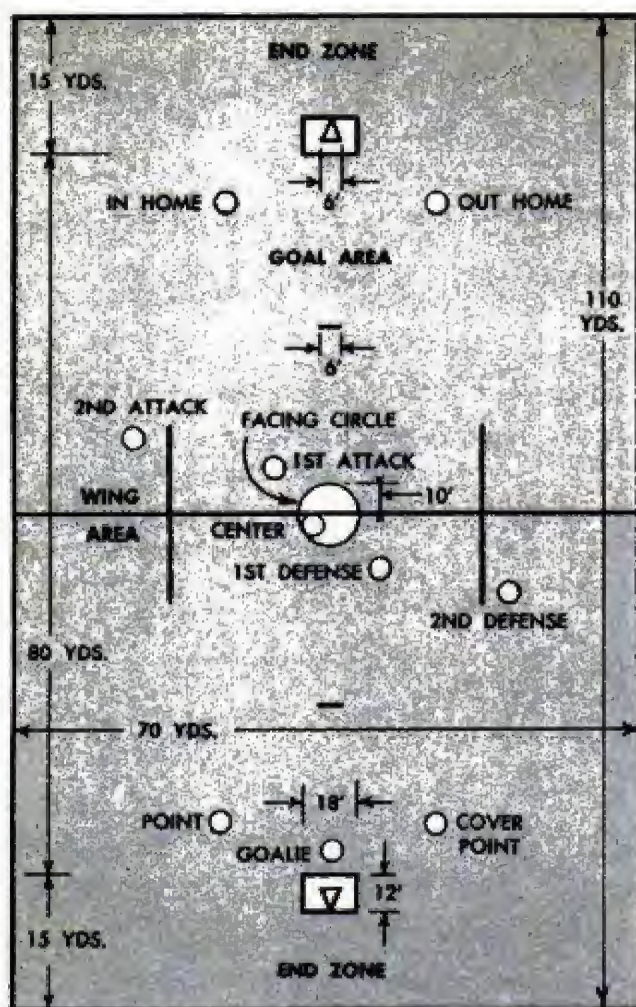


Diagram shows field with one team lined up for a face-off. Opposing players stand beside these men

Here only the goalie stands between the ball and a score. Attacker has completely eluded opponents

from opposing sticks beat a tattoo on hands, arms and shoulders, these areas are given special protection. Pads strapped to the shoulders extend down the forearm and heavy gloves protect the hands. In addition, each player wears a helmet with a wire face guard.

Lacrosse is played on a field 110 yards long and 70 yards wide, with the two goals, similar to hockey nets, 80 yards apart. Each team consists of 10 players—a goalkeeper, three defense men, three midfield men who play both defense and offense, and three attack men. Each player carries a "crosse," a stick three to five feet long terminating in a snowshoelike web in which the hard-rubber ball is carried. Four 15-minute periods constitute a game.

To start play, the ball is placed between the sticks of the two centers crouched at midfield. Upon the referee's whistle they draw, trying to gain control. From that point the game moves as fast as the 20 fleet-footed athletes. The ball can be carried in the stick, kicked or passed.

The object of the game is to disorganize the opposing team's defense so that a man can be shaken free for a reasonably clear shot at the goal. At no time during the game can a team have less than four men on the defensive side of the center stripe or less than three men on the attacking side. The disposition of the remaining players is optional.

Rough stuff occurs when a player has the ball cradled in his stick and is threading his way toward the opposing goal. Defense



men can whack down on his stick or the hands that hold it, or they can stop a runner with a jarring body block.

The runner can dodge opponents, zip the ball to a teammate or try a shot at the goal. The crosse acts as a sling when passing or shooting, giving the ball tremendous speed and impact, as many goalies, black and blue despite their heavy padding, will testify. Penalties are less frequent than in basketball or football because rules are simple and violations easily detected. Players know that a foul will leave their teammates shorthanded, as a player who has committed a foul goes to the penalty box for a specified time.

Some schools say "too rough" and turn their backs on lacrosse. Unofficially, the game has been tagged "organized mayhem," and anyone who has watched a runner caught in the "crosse fire" of two clubbing defense men might agree.

Actually, the heavy padding, helmets and face guards prevent injuries—the fearful clatter during a game is the crash of stick on stick and not the sound of splitting skulls. Wesley Knight, Williams College trainer, cites figures to prove that injuries are less frequent and less severe than those of football, soccer or even basketball. "Howdy" Myers, coach at Johns Hopkins, can recall only one player who suffered a broken bone, and Myers has been fielding lacrosse teams for 16 years.

The Johns Hopkins coach has run up a phenomenal string of victories with his teams. Before coming to the university he



Johns Hopkins photo

Ball is "cradled" in the pocket by twisting the stick on the run

Skirmish for ball may bring stick crashing down on player's head





Length of stick and size of net vary with position played. From left to right are the attack, midfield, defense and goalie sticks

coached a prep team, and his school and college squads won 71 straight games before the spell was broken in the Open Match play-off last year. Johns Hopkins lost to the Mt. Washington Club team, 6 to 5, in a seesaw battle.

Mt. Washington members are all rabid hunkers and will buttonhole anyone who shows the slightest interest in lacrosse. The club is composed of former lacrosse stars. Their team plays a schedule as stiff as any in the country, and no college team can claim the national Open Title without first whipping the Mt. Washington Club.

A good lacrosse player appears to combine the speed and power of an express engine with the precision of a ballet danc-

er. His passes must have bulletlike accuracy.

Once Coach Myers started a friendly argument with a baseball coach who scoffed at the precision of lacrosse. Myers challenged him to a baseball game—lacrosse players to handle the ball only with their sticks. The befuddled baseball team was completely outclassed by the quick fielding and bullet throws.

A typical tilt has all the excitement of a tight football or hockey game. Last year Johns Hopkins trailed Princeton by two goals with three minutes to play. The team managed to push through one goal, then with 30 seconds remaining, zipped the ball into the net to tie up the game. In the over-time period the Hopkins sharp-

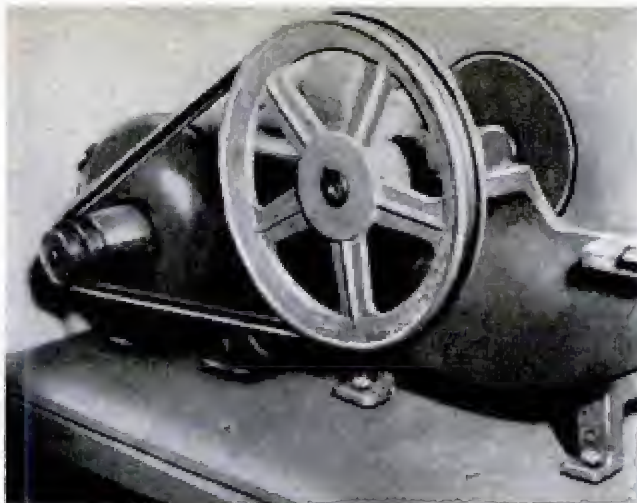
shooters whipped in two more goals to win.

There are a lot of laughs in the game, too. Occasionally a player will race the length of the field, crash through the defense men, jockey the goalie out of position and make a spectacular shot—only to discover that the ball dropped out of his stick at the other end of the field.

The U. S. Intercollegiate Lacrosse Association draws up rules and schedules for college lacrosse. Seven new members have joined in the past three years—convincing evidence that the game is spreading. The superiority of the "Big Five" of lacrosse—Johns Hopkins, Army, Navy, Princeton and Maryland—may be challenged soon by teams from farther west.

Navy attack man at right whips a bullet pass past the outstretched stick of a Johns Hopkins defense man





Heat Forms Joint in Endless Belt

When heated to 300 degrees Fahrenheit, the ends of a plastic belting material can be fused to form an endless belt of any desired length without the use of hooks or other fasteners. The smooth joint is as strong as the belting material, which is available in a variety of sizes and shapes for small power tools. Although not essential, a special fusing tool speeds the joining operation by insuring exact heating of the material. When softened by the heat, the ends are held together for a few seconds and become permanently fused. Any rough spots are smoothed by sanding.

Cash Register Pays Jack Pot

Wired to the cash register, a jack-pot machine pays a cash bonus to the customer whose sale is the lucky one. The machine pays off irregularly and unpredictably, but the merchant can select the frequency by hundreds of sales. The machine can be set to pay the bonus in any group of hundred sales, but the exact sale cannot be predetermined as its selection is based on minor changes in room temperature. The merchant places whatever amount he chooses in the jack pot. Each person winning a bonus is required to answer a simple question before being given the money so as to avoid legal restrictions.



Shaver "Rocks" Away Whiskers

Whiskers are "rocked" away by a dry shaver that uses no electricity and requires no winding. Rocked back and forth against the skin, the razor whisks off the beard. Its many blades are fixed in such a position that they sharpen during use. According to the manufacturer, the razor is a full-fledged razor and is not designed solely for "in between" shaving, although it can be used for that purpose.





Japanese Admiral's Flagship to Be Made Into Museum

Embedded in concrete, a former Japanese admiral's flagship will be turned back to that country for conversion into an art museum and recreation center. As

the battleship Mikasa, it was the headquarters of ex-Admiral Heihachiro Togo. It is located inside what is now the Yokosuka Naval Base of the U. S. Navy.



High-Speed Camera Has No Shutter

Rifle bullets are slowed to one inch a minute with a high-speed movie camera which has no shutter. The camera takes as many as 11,000,000 separate pictures a second. Instead of the conventional shutter, which could not be opened and closed fast enough, a complicated system of lenses dissects the images cutting them into narrow strips of light that are recorded on the film. The images are reconstructed from these strips by projecting them through another camera onto a final film. The film in the high-speed camera speeds past the light opening at 400 feet per second. An electric motor powers the film drum. Suitable only for scientific use, the pictures appear blurred when projected.

Popular Mechanics is always ready to supply further information to readers about various products described in any issue. Just write to Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11

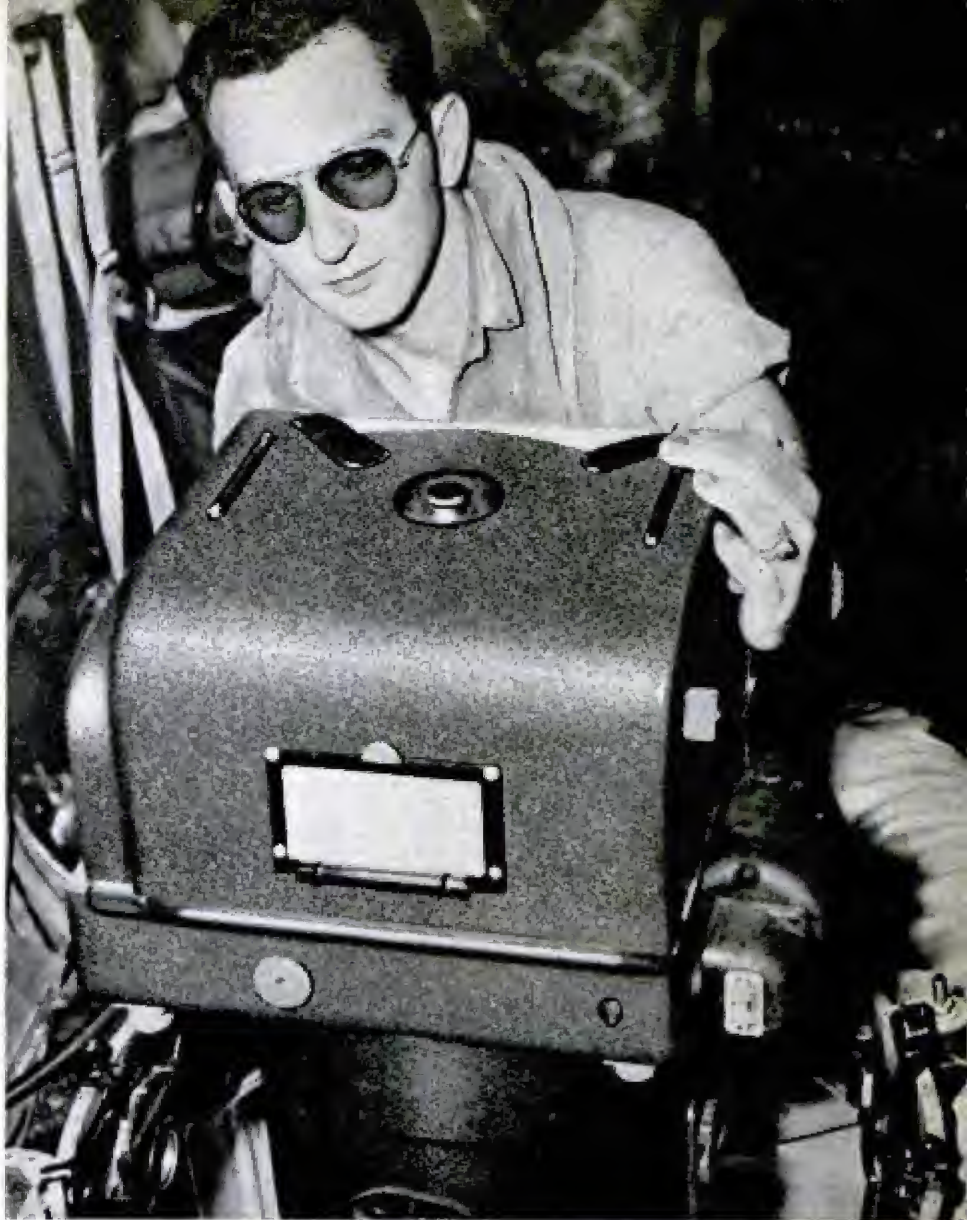
By Phillip S. Kistler

MANY a Hoosier farmer, plowing alongside the highway, may have looked up in startled wonder at an airplane flashing over his fields, scarcely 200 feet above the earth, almost skimming the treetops. Some of these farmers probably turned back to their work muttering, "Dern fool."

If so, they might well have saved their breath. For this was no thrill-packed joy ride they were witnessing, but a carefully planned and executed photographic expedition. Indiana's highways were getting their pictures taken, and the results were to be instrumental in revolutionizing highway maintenance, design and traffic control.

The man and the machine responsible for these remarkable innovations in highway performance studies are Prof. K. B. Woods of the Purdue University Highway Experimental Station, and the Sonne continuous strip camera. The aerial camera was invented and developed by F. T.

Through an aerial camera's "eyes" (right) faulty highway design and construction are easily detected. Below, camera makes traffic photos to help highway engineers



Hedge-Hopping Highway Engineer





Sonne of the Chicago Aerial Survey Company (see *Popular Mechanics*, May 1946, page 124). Shutterless, it utilizes a new photographic principle to take a single continuous exposure 200 feet long at unprecedentedly low altitudes.

Conventional aerial photographs, used for some time in the solution of certain highway problems, have proved more or less inadequate because they lack detail. It remained for the Sonne continuous exposures to give a thorough and workable layout in low-level strip surveys for highway maintenance studies. Professor Woods saw possibilities of these exposures for highway use when witnessing an Army exhibition of strip camera photography in low-altitude reconnaissance flights.

To highway engineers, the evaluation of each pavement crack is of utmost importance, as it signifies pavement breakdown. Engineers were formerly required to walk the highways, locating and measuring even the smallest crack in the surfacing material. The time involved in this tedious undertaking was considerable. But now, through laboratory study of low-altitude strip photographs, each crack can be seen and estimated with amazing rapidity. Surveys that required months and even years to accomplish are now completed in a matter of hours.

The importance of speed in solving the highway maintenance problem can hardly be overemphasized. The Sonne surveys provide an almost simultaneous picture of the various parts of a highway system, and are especially valuable when taken at a chosen time of the year, such as the spring-thawing period when slow seepage of water undermines the roadbeds.

"Pumping," the maintenance engineer's biggest headache, can be detected in Sonne pictures by streaks of mud and water which have squirted up through the seams between ad-

Potential trouble points are ferreted out by the camera. Here is a dangerous bridge approach that was not marked



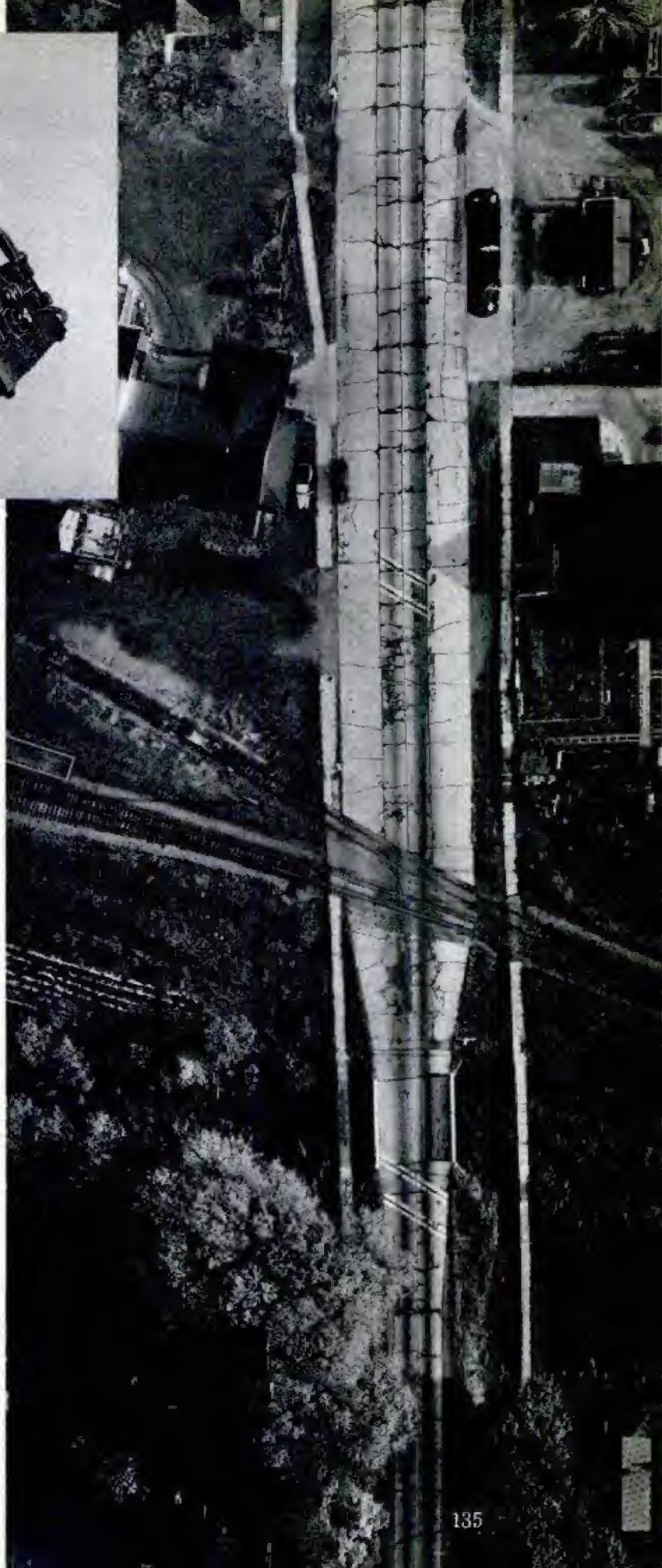
Highway photos being studied through a stereoscopic viewer. Right, black lines in pavement, indicating a breakdown in surfacing, show clearly in strip photo

jacent pavement slabs. The water immediately below the pavement joints causes a pumping action as vehicles, passing over, depress the slabs slightly. The water squirts up through the joint, carrying with it some of the soil. Soon a hole develops below the joint, the slabs can no longer bear the load of the passing traffic, and a serious breakdown occurs.

It is difficult to locate a pumping pavement except when the action is taking place; but, obviously, it is impracticable to have enough engineers to cover a state's entire highway system at the period when rains seep into the soil and cause pumping. Here the speed of strip-camera surveys, taken during this short pumping period, provides information that make leisurely and thorough evaluations in the laboratory possible.

Strip-camera pictures are also of inestimable value in the detection of "faulting," the vertical offsetting of two adjacent slabs of concrete pavement. Indiana highway engineers were able to locate faulting action in the Sonne photos readily because it followed a unique pattern easily seen in the pictures. There is a slight bump where the two slabs are offset. As cars

(Continued to page 268)





LIGHTS APLENTY—Above left, five individual flash units provide press cameraman Oscar Sweet of New York with plenty of light for outdoor action shots in color. The flash guns, mounted on a metal strap, go off simultaneously when the shutter is clicked

NO DIPPING, PLEASE—There's no need to dip this roller applicator (upper right) into the paint. It has a paint supply in the roller. You fill it through an opening in the side. Flow of paint is controlled by the amount of pressure applied against the wall

LOG THIS CALL—Left, logging camps in the woods of northern Ontario use portable 60-watt FM stations to keep in contact with headquarters. Radio orders for repair parts get fast action, boosting production by minimizing the time lost during breakdowns

AIRPORT FERRY—Below, plane passengers speed from downtown Boston to the airport across the harbor in seven minutes. The Diesel-powered ferries are 37½ feet long and the large windows give the 22 passengers an attractive view of the harbor and skyline





ELECTRIC MUSIC of the Ondioline (top), shown at a Paris fair, is amplified by any radio. The player imitates various instruments on the piano-type keyboard

LEVER-PEDAL BICYCLE (top right) invented in France is reminiscent of a model used years ago. However, combining the levers and sprocket makes pedaling easy

JAPANESE MOTOR CARS (right) get 30 to 40 miles on a gallon and can travel up to 54 m.p.h. The sedan and small truck are the first postwar models in production



NAVAL LANDLUBBER (below) will never go to sea. Built at the San Diego Training Center, the 44-foot aircraft carrier is complete even to guns that really fire. The planes on its deck have tiny motors





WHAT'S NEW *For Your Home*

A four-page "shopping section"
dedicated to modern homemakers

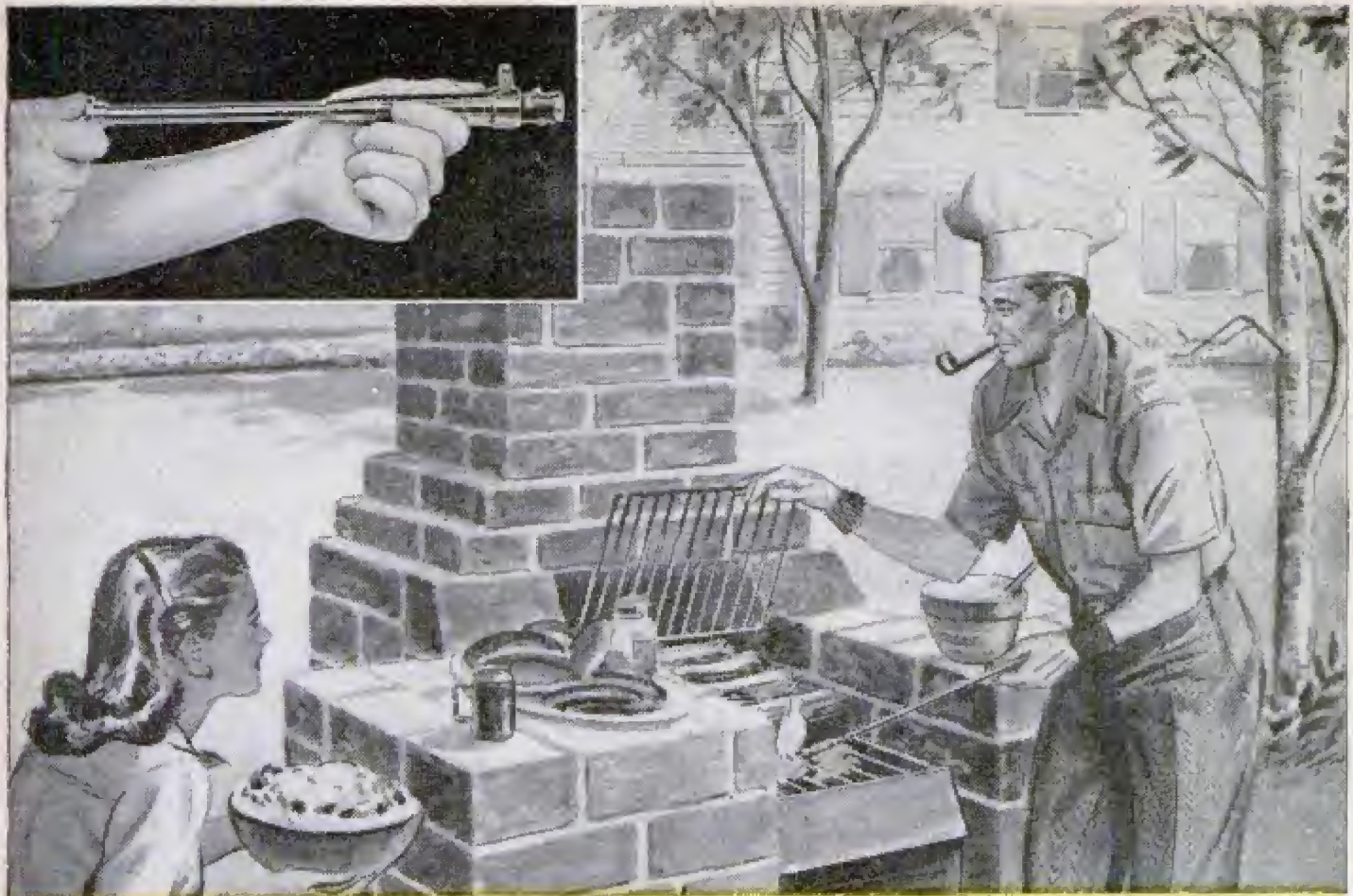


LIGHTWEIGHT LAWN MOWER weighs 19 pounds and cuts to within one inch of walls. Rear rollers spin blades

SELF-WRINGING MOP has a cellulose sponge that folds like a book when sleeve on the handle is pushed. It mops without splatter and wipes dry

OUTDOOR COASTERS keep drinks from spilling during lawn parties. Spike-tipped, the tulip-shaped holders raise glasses off the ground and away from the bugs



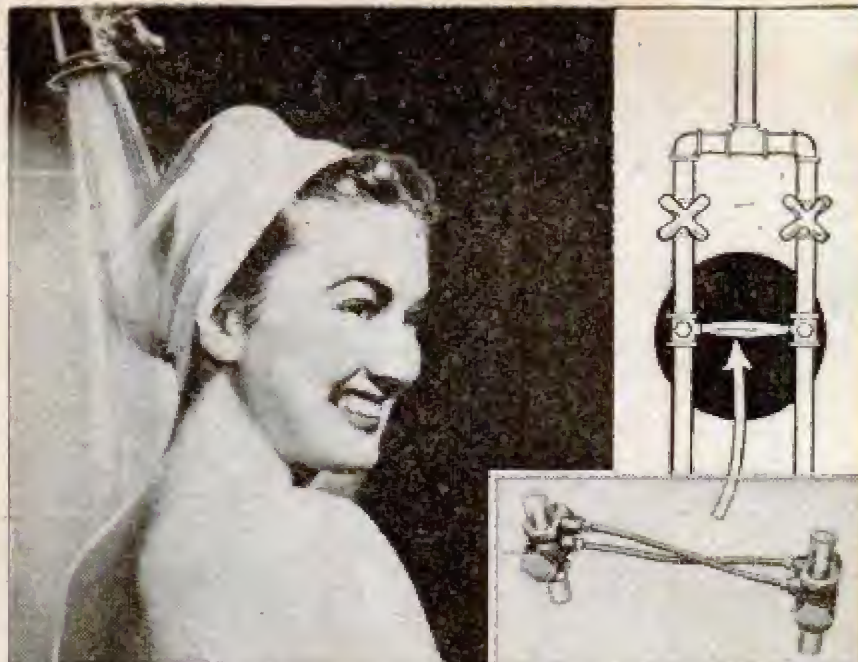


FIRE LIGHTER ignites when the barrel is slid back. It burns lighter fluid and works indoors and outdoors

MULTI-PURPOSE BRACKET, permanently mounted on edge of table, holds various kitchen utensils. Slipped into the bracket, tools are held firmly by a retaining ring

HANGING STEP provides a safe platform when windows are washed or painted. Made of steel, it eliminates the danger of ladder-climbing

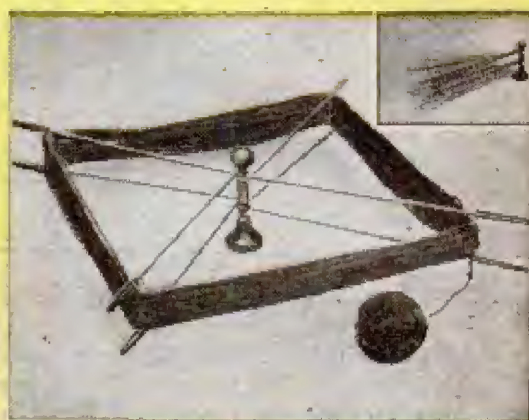




WHAT'S NEW *For Your Home*

Continued from preceding page

TEMPERATURE GUARD in showers ends unexpected changes in water temperature due to decreased pressure. Fully automatic in operation, it is easily installed on any shower

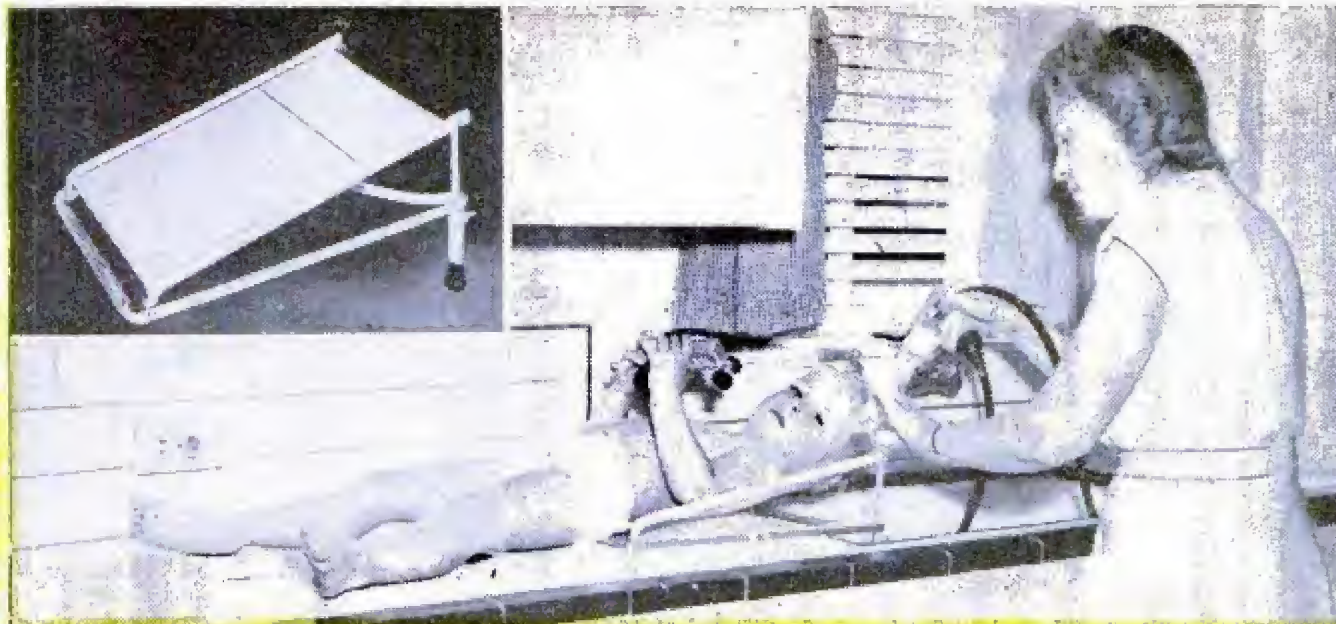


YARN HOLDER simplifies winding of skein yarn into balls. Adjustable, it folds into small space (see insert) and has a suction cup to hold it in place as the yarn is unwound



POT LIFTER, made of stainless steel, grips firmly hot pans of any shape, ending fear of burned fingers. It can also be used to crack ice and small nuts. Its toothed jaw serves to tenderize meat and to scale fish

SELF-FOLDING PLAY PEN folds easily when a foot lever is pressed. Compactly folded, it can be rolled on its casters. With baby inside, it is locked open by a safety catch



BATH RACK solves the shampoo problem for both mother and child by helping to keep soap out of his eyes



KNIFE SHARPENER gives blade a keen edge with a few strokes of its tungsten-carbide insert



BEDSIDE LIGHT has no hard-to-find switch. To turn on the light you merely press down on the tilting shade

NONSKID MESH "locks" scatter rugs in place by the clinging action of its rubber coating

ELECTRIC CHURN can be adjusted to fit almost any jar or crock. Easy to use, it makes butter in 15 minutes



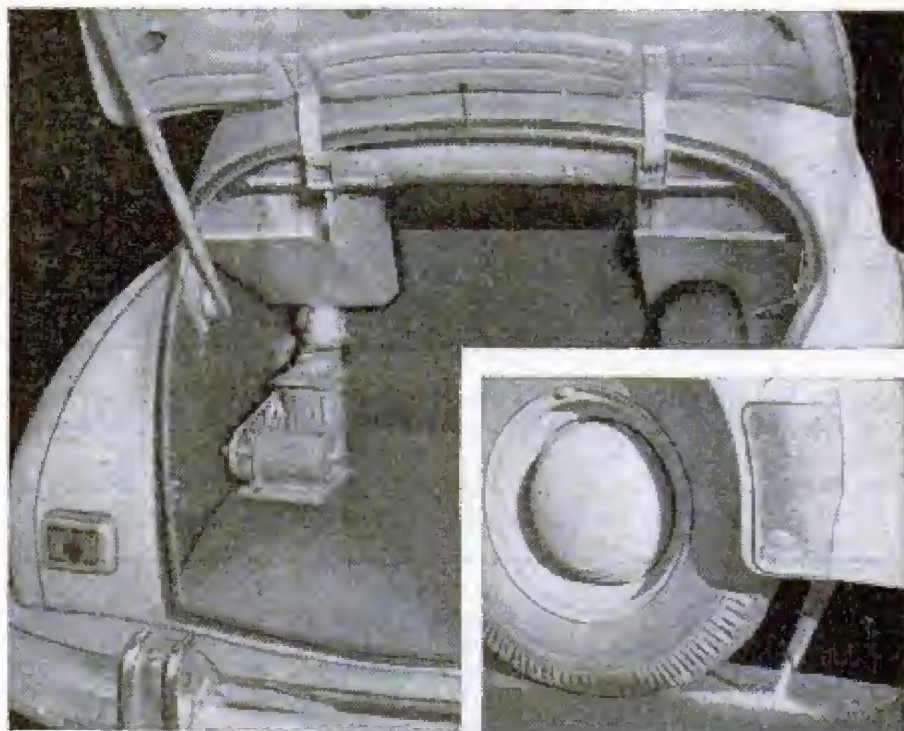


Baby Rides Safely In Car's Play Pen

Children ride in comfort and safety when the rear seat of the car is converted into a play area by a removable fabric partition. A wooden pole, inserted through a hem in the fabric, clamps to the rear window ledge and supports the partition. The lower end of the fabric is tied to the seat springs. When not in use, the partition is lowered over the front edge of the seat in a few seconds. It can also be used to hold small packages and salesmen's samples on the back seat.

Car Sprinkles Sand On Icy Pavement

Icy pavements are no problem to motorist Robert Root of Vermilion, Ohio. When his car loses traction he presses a control button on the dashboard and a sand spreader in the car trunk sprinkles sand in front of the rear wheels. An automobile starter motor drives a small compressor that feeds compressed air directly into air-sand mixing chambers under two sandboxes. The air forces the sand through two hoses to the pavement. The mixing chambers are the same as are used on locomotives.



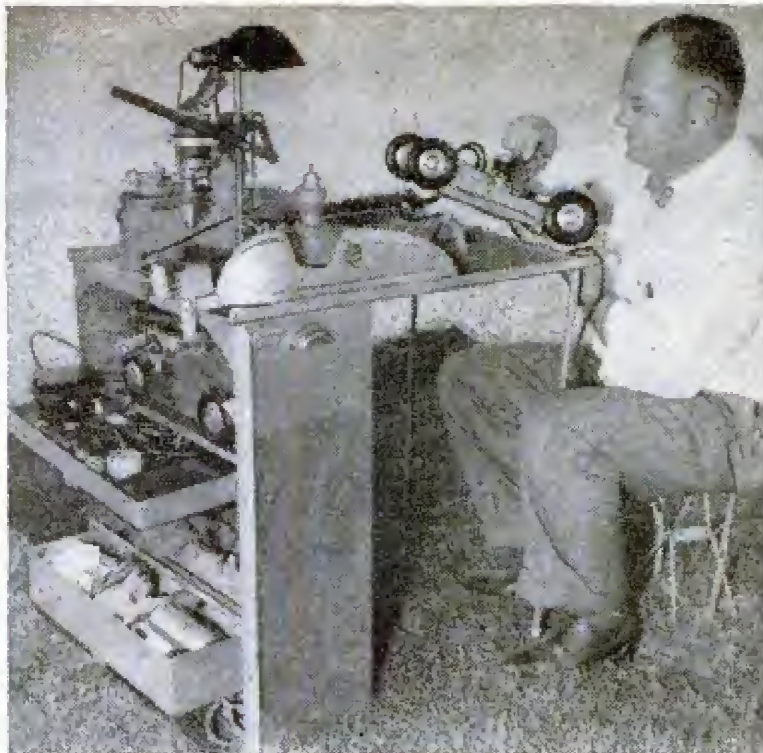
A dash button starts the compressor, spreading sand on the icy pavement



Aluminum Luggage Rack Holds 400 Pounds

Suitable for carrying up to 400 pounds of luggage or camping equipment on top of a car, an 18-pound aluminum carrier is held in place by four-inch suction cups and adjustable safety straps. The carrier, 3½ by 4 feet in size, remains securely in place while the car is in motion.

☐ America's automobile repair bill for 1947 totals about \$7,000,000,000, according to the National Automobile Dealers Association.



Hobbyists' Workbench Folds to Suitcase Size

Model hobbyists now can fold up their benches and equipment and take them out into the field during model tests and trials. Weighing only 11 pounds empty, a combination tool kit and workbench made of aluminum folds to the size of a large suitcase. Opened, it forms a bench for small power tools that are adapted for use on either 110-volt or 6-volt current. Among the power tools are a modelmaker's lathe, drill press and vise. Drill-press attachments include a buffing wheel and an air compressor for paint spraying. An adjustable lamp lights the bench for night work. Five drawers provide enough room for all the power tools, additional equipment and a folding seat. Also included is an overhead awning with aluminum supports that telescope to fit on the side of



Combination tool kit and workbench for model hobbyists folds into a compact case for carrying. Weighing 90 pounds, it can be taken into the field during tests. The awning is included

the case. Loaded with tools and equipment, the unit weighs about 90 pounds and can be carried on the rear seat or in the trunk of an automobile.

Eyes That See "Invisible" Light Spoiled Wartime Plan

Because a few eyes can see "invisible" light, a wartime plan to use ultraviolet rays to land planes on carriers was never used. Navy aircraft were to use searchlights sending out only ultraviolet rays and carriers were to have special reflectors, each with a fluorescent button which the rays would cause to glow brilliantly. Diffused light from the buttons would be collected by the curves of a mirror and concentrated through a special lens that

would send a very narrow beam back to the pilot. The beam is so narrow, only a few feet wide after traveling a mile, that an enemy pilot flying wing to wing with the landing plane couldn't see the light outlining the carrier. University of Rochester scientists, who developed the reflectors, found, however, there was a chance that an enemy pilot might possess the unusual ability to see the ultraviolet rays which are invisible to most eyes.



Boeing Aircraft photo

They Blaze the Trail into Space

By Thomas E. Stimson, Jr.

APPROACHING the time when they will build inhabited space machines, aeronautical engineers are testing rocket-thrust aircraft that can ascend to 100,000 feet or more. Bell's XS-1 and the new Douglas Skyrocket have ceilings limited only by amounts of fuel they carry.

These experimental aircraft have one main job: to serve as pathfinders for new high-flying transsonic military aircraft. Much of their research will be at heights not exceeding 60,000 feet, collecting information that can help raise the ceilings of turbojet and piston-engine planes.

At 60,000 feet an air crew must have extraordinary protection to remain alive. The temperature averages 99 degrees below freezing on the Fahrenheit scale and the air pressure is about one pound per square inch, compared with almost 15 pounds per square inch at sea level.

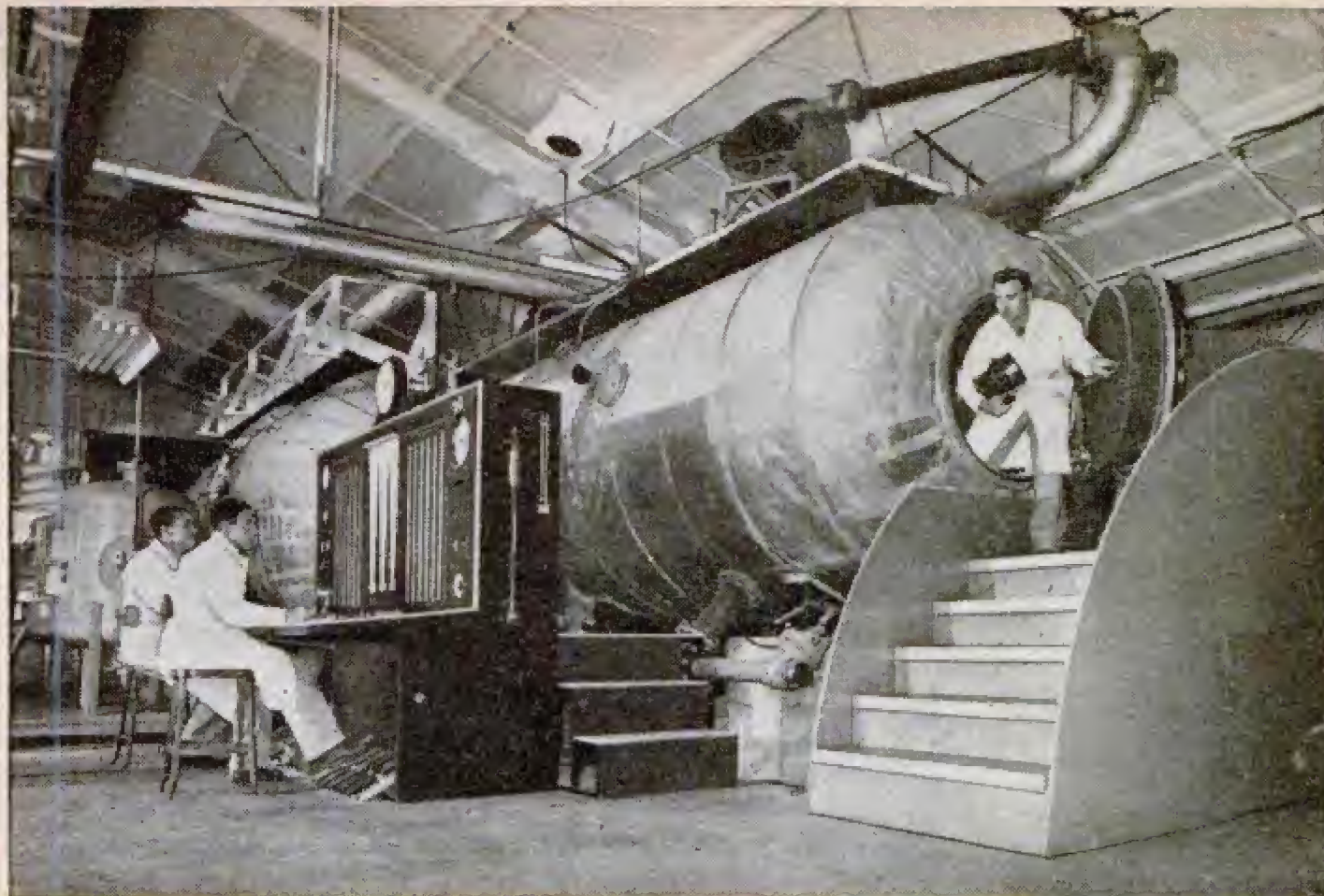


Crew in pressurized cabin flies at 43,000 feet without masks. For every mission topping 40,000, emblems like the one at left are put on the plane

The sky looks purple-black and there is virtually no twilight period between day and night. There isn't enough oxygen to support a candle flame. Gasoline boils and must be kept under pressure and the altitude is almost reached at which blood boils at body temperature.

Presumably high-flying pilots will wear pressure suits inside their pressurized cockpits. Aircraft are not yet built strongly enough to maintain high internal pressures at such altitudes.

The fight for altitude is a military necessity. Bombers try to get above the fighter planes and the fighters in turn strive for more altitude so they can swoop down on the bombers. With their heavy loads, few aircraft were able to climb above 35,000 feet in the last war, but most



AIRsearch Company photos

Chamber in left background can be evacuated to pressure at 70,000 feet, while, separated by thin partition, cell at right simulates pressurized cabin. Below, controls for temperatures and pressures in and between cells

of the newest military aircraft have service ceilings announced as in excess of 40,000 feet. Boeing's XB-47 bomber and the North American XP-86 fighter, both swept-wing and powered by turbojets, have pressure cabins that eliminate the need for special clothing and oxygen equipment at extreme altitudes.

More power for the air-breathing turbojets and piston-engine aircraft is only one of the numerous high-altitude problems. Another concerns the shape of the plane itself.

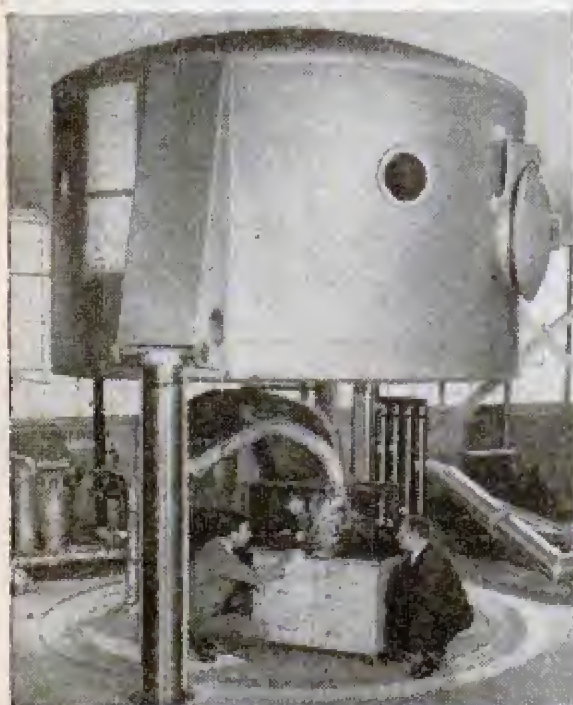
"It is conceivable that a heavily loaded bomber, flying high and fast, would have to continue to fly straight and level to avoid self-destruction," states a Boeing engineer.

"This odd situation could happen to an aircraft of high wing loading that is flying, say, at 550 miles per hour at around 35,000 feet. If the airplane increases its speed it encounters compressibility effects that cause flutter and porpoising, quite possibly leading to structural failure. If the airplane slows down, it stalls and this could cause a heavily loaded craft to break





Swept-wing XB-47, a 600-mile-an-hour high-altitude bomber

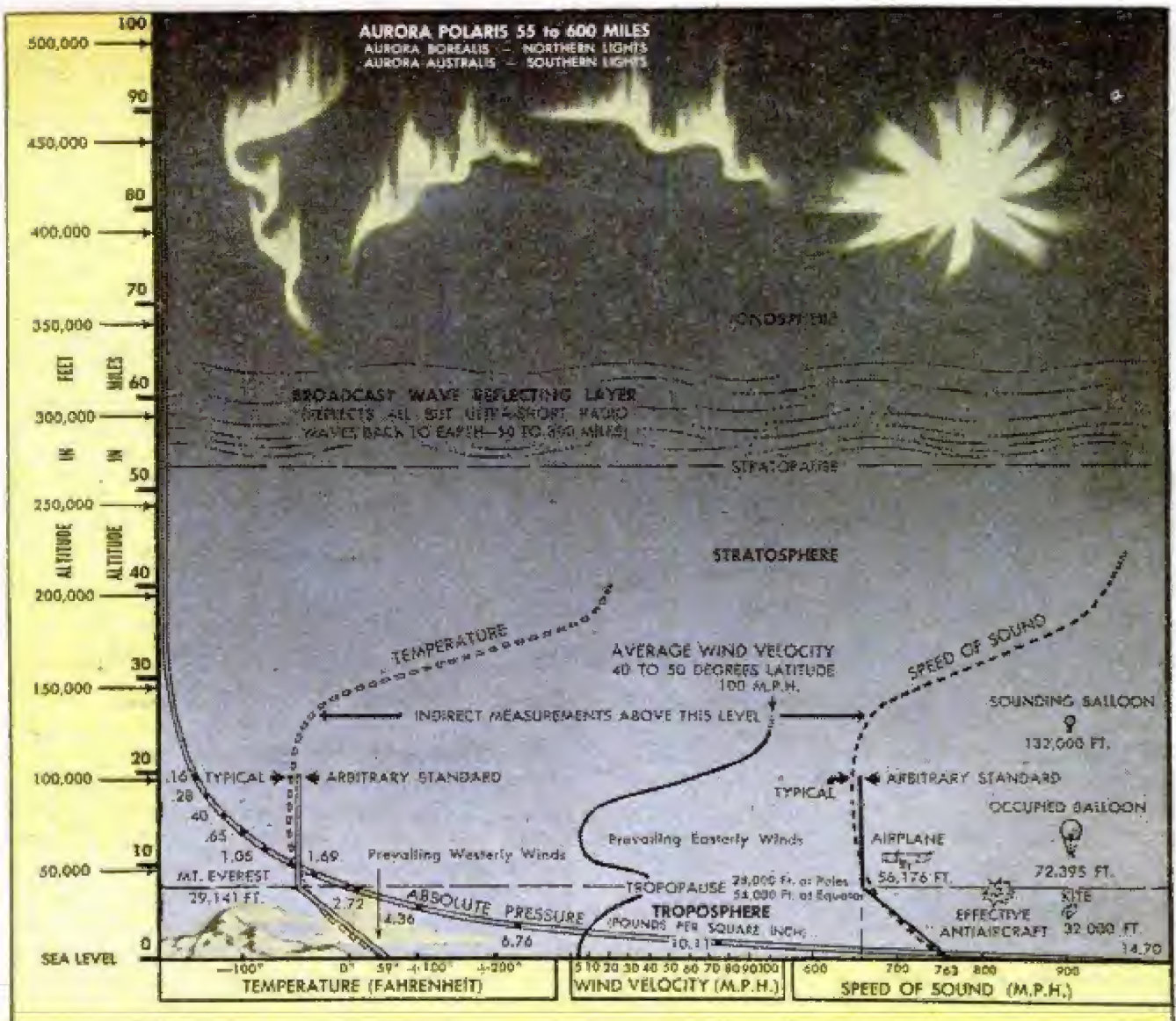


apart. It dare not climb for fear of a stall, it dare not turn for fear of stalling, it dare not dive because of the flutter that the increased speed would bring. Not until its fuel load is materially reduced, in turn cutting down its wing loading, could the pilot maneuver in safety. The time is approaching when we must take this into consideration in designing aircraft."

Strangely enough, man's probing into the subzero stratosphere brings on new problems in cabin refrigeration. Instead of keeping the pilots and crew members warm, the question often enough is how to keep them from roasting. This is because air must be taken into the plane and compressed in order to maintain pressure in the cabin, and air's temperature

Temperatures and pressures above 60,000 feet can be simulated in bell at left when it is lowered to floor. Below, testing jet-assist take-off units at the rear of an XB-47





Adapted from Douglas Aircraft Company chart

Characteristics of the atmosphere, all pertinent to high-altitude research, are summarized above

automatically goes up when it is compressed. Even at 30,000 feet this heat rise can amount to several hundred degrees.

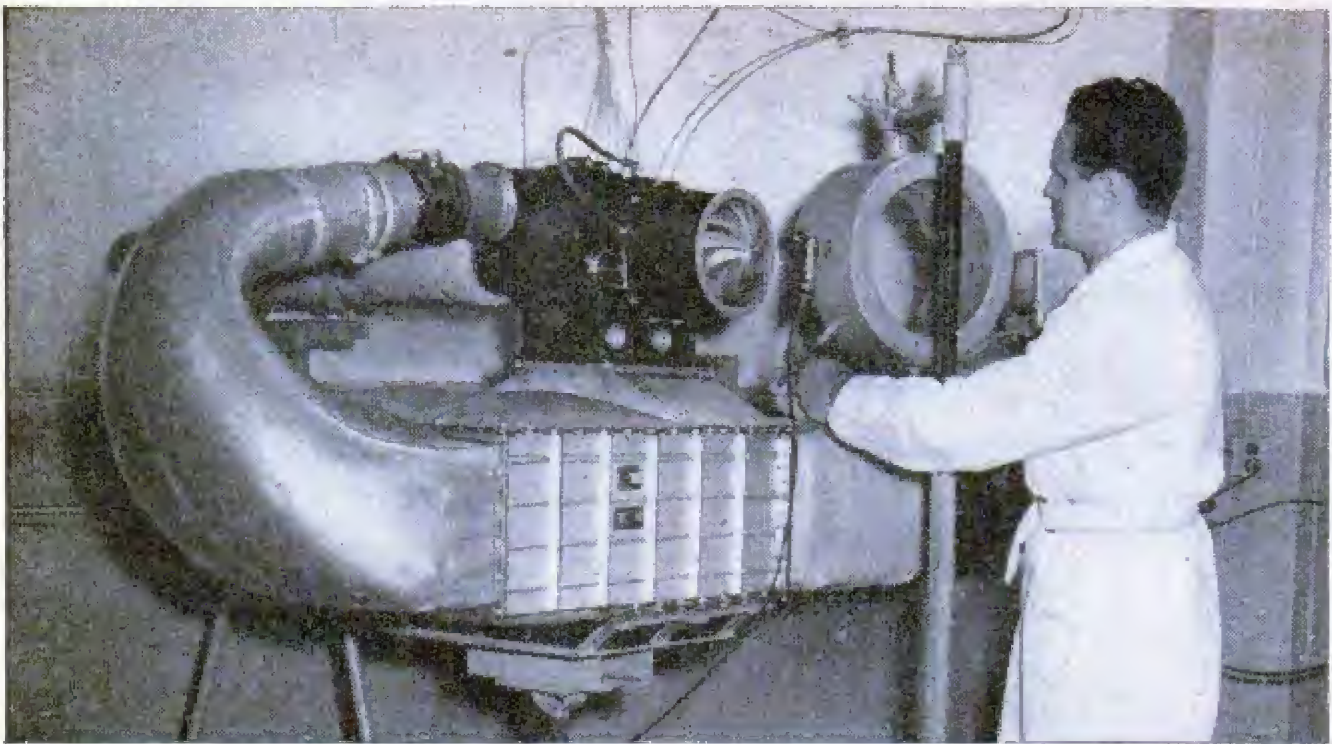
An ordinary refrigeration plant would be too heavy and too bulky for an airplane. Instead, a tiny high-speed turbine wheel is used to pull the temperature down. The superheated air coming from the compressor first passes through a heat exchanger, partially reducing its temperature, then it is delivered to the turbine. Expanding and slowing down as it spins the turbine wheel, the air is automatically cooled.

AiResearch Manufacturing Company, developers of the air expansion turbine, provided a 16½-pound refrigeration unit for the Skyrocket that does the same work as would be performed by 40 household refrigerators. The heart of the unit is an aluminum turbine rotor that spins at more than 100,000 r.p.m. and is about the size of a silver dollar. Pressurized air for the Skyrocket cockpit is taken from the compressor of its main turbojet engine at about 500 degrees Fahrenheit, and the little refrigeration plant pulls this temperature

down as low as 40 degrees. On a hot day near sea level the turbine sometimes spits snow and ice.

A modern cockpit or cabin pressurizing system consists of three units, an air compressor (unless compressed air is obtained from the compressor of a turbojet engine), the refrigeration unit, and the cabin-pressure regulator. Both the temperature and ventilation are likewise controlled automatically.

One of the hazards of high-altitude flight that has not yet been solved is that of explosive decompression, the sudden lowering of pressure that occurs if the cabin wall is ruptured. This can happen because of structural failure, such as the blowing out of a window, or by the piercing of the cabin wall by an enemy shell. A human can withstand the mechanical effects of rapid decompression at fairly high altitudes, but the body is then subjected to the subzero cold, lack of oxygen and low pressure of its surroundings. At extreme altitudes, explosive decompression alone appears to be lethal.



Testing turbine for a DC-6 refrigeration unit. Cooling the compressed air is a major problem

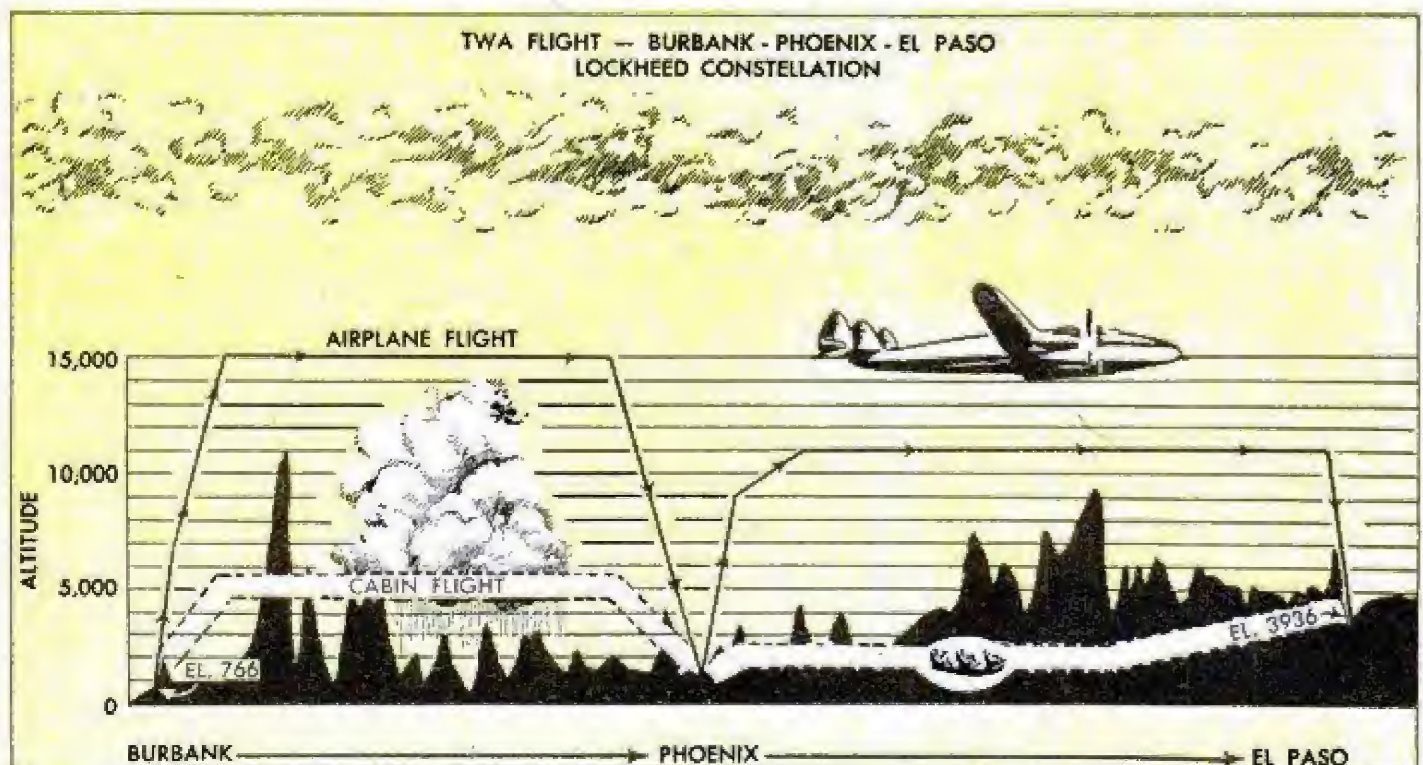
Pneumatic clothing that will automatically and immediately pressurize an air crew if the cabin loses its compression seems to be the best solution. Aeromedical authorities agree that eventually clothing will have to be developed that allows a flyer to survive in a vacuum.

Setting new altitude records is only an incidental part of upper air research. What the engineers are striving for is to develop equipment and materials so that all parts of a plane will always function perfectly at any altitude. Ordinary grease freezes

at low temperature, for instance, making the controls difficult or impossible to operate. During the war a number of bombing raids were complete failures because the bomb-bay doors were frozen shut by congealed grease. Since then new synthetic nonpetroleum greases have been developed that won't freeze, and studies are being made of silicone-type lubricants for the same purpose.

Electrical equipment located outside the pressure cabin is afflicted by many ills. The various rates of contraction of differ-

In pressurized cabins, passengers literally fly underground when traveling over the mountains



ent materials at low temperatures cause devices such as limit switches to operate erratically. The effect of low temperature on the resistance of conductors and resistors changes the potentials of circuits. Moisture freezes and sheathes contact points with ice. When moisture isn't present the thin air contributes to arcing and overheating of switch points. Generator cooling becomes a problem unless the cooling air is supercharged to an efficient density. Comparable troubles occur with radio and radar.

Many problems are solved on the ground by using altitude chambers which simulate the pressures and temperatures of high altitudes. These are now standard tools that nearly all aircraft manufacturers use constantly. Augmenting the huge altitude chambers in which a large piece of aircraft structure may be tested are smaller one-man chambers in which engineers may "ride" to altitude while observing and adjusting some small device that is under test. Smallest of all chambers are the bell jars that are evacuated in the laboratory for testing electrical equipment. Using sealed-in switches, an engi-



North American Aircraft photo

Ceilings for fighters, like the XP-86, have been pushed above 40,000 feet

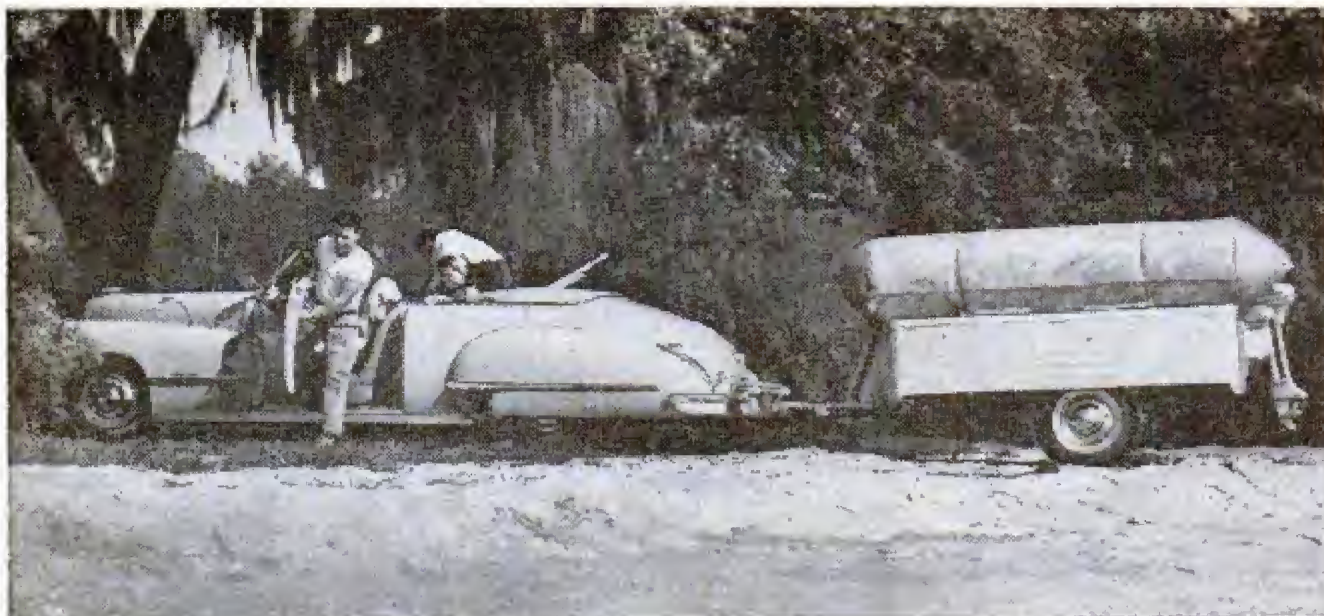
neer can turn on and off the current to an electric motor inside the bell jar, gauging performance at various altitudes.

A unique chamber that resembles a huge steel diving bell is used by the El Segundo division of Douglas Aircraft for conducting tests at up to 60,000 feet altitude and at temperatures as low as -65 degrees. Its virtue is that the entire bell, weighing many tons, may be raised from the floor by two hydraulic jacks, and heavy pieces of equipment that are to be

(Continued to page 246)

Left below, the three-pound turbine at left cools cockpit air in Skyrocket, Skystreak and P-80 aircraft. Large one is used in DC-6s. Right below, looking through plastic dome at parts being tested in vacuum bell jar





Trailer Provides Shelter Both on Land and on Sea

Changing from land to water operation takes only a few minutes with an all-aluminum trailer equipped with rubber-lined pontoons. The pontoons are inflated at any service station. When the two covers are folded back, the floats are in outrigger position to provide buoyancy and stability. Wheels are detached once the trailer is in the water. Fabric covering over a metal frame protects the occupants from the weather. Sleeping accommodations for four are built into the trailer. A folding table, stove and cooking equipment enable



the fisherman to eat his catch without coming ashore. The camp also can be set up on land with pontoons still in position.



Core Cutter Routs Wood Patterns

Core boxes for molds are cut by an "internal lathe" that routs out patterns in wood. The machine has two handwheels locked together on a supporting guide frame. The motor and cutter are mounted in the center of the machine directly above the work. To operate the machine, the frame is placed over the block of wood and the router is set to cut a semicircle of the proper diameter. Turning the handwheels moves the motor and cutter to rout out the block to that diameter. The machine will work out a half circle or any portion of the arc, cut ribs, flutes and recesses and shape convex as well as concave surfaces. Diameters up to $7\frac{1}{2}$ inches can be cut in work of any length. With the addition of a circular base the machine has a universal motion for cuts in both a horizontal and vertical plane.

¶ Argentina has established a radiophoto circuit to Switzerland and Portugal.



Two-in-One Fireplace

By moving the panels of a two-section fireplace, homeowners can produce an electric heater or a wood and coal firebox. The fireplace is manufactured in Britain and fits into the standard British chimney opening. When a decorative outside panel is raised, the electric heater can be lowered into place to warm the room. Later, with the room at the proper temperature, the electric panel is raised to reveal the open firebox for burning wood or coal to maintain the temperature and to keep a low-combustion fire burning all night. The fireplace also heats the household water and has a built-in air-circulating system. The built-in fireguard can be lowered when the fireplace is in use to protect children from sparks.



Top left, mother takes chill from room with electric heater. Center, she lights wood fire and, above, pulls down guard. Top right, banked fire is covered for night



No Double Exposure With This Camera

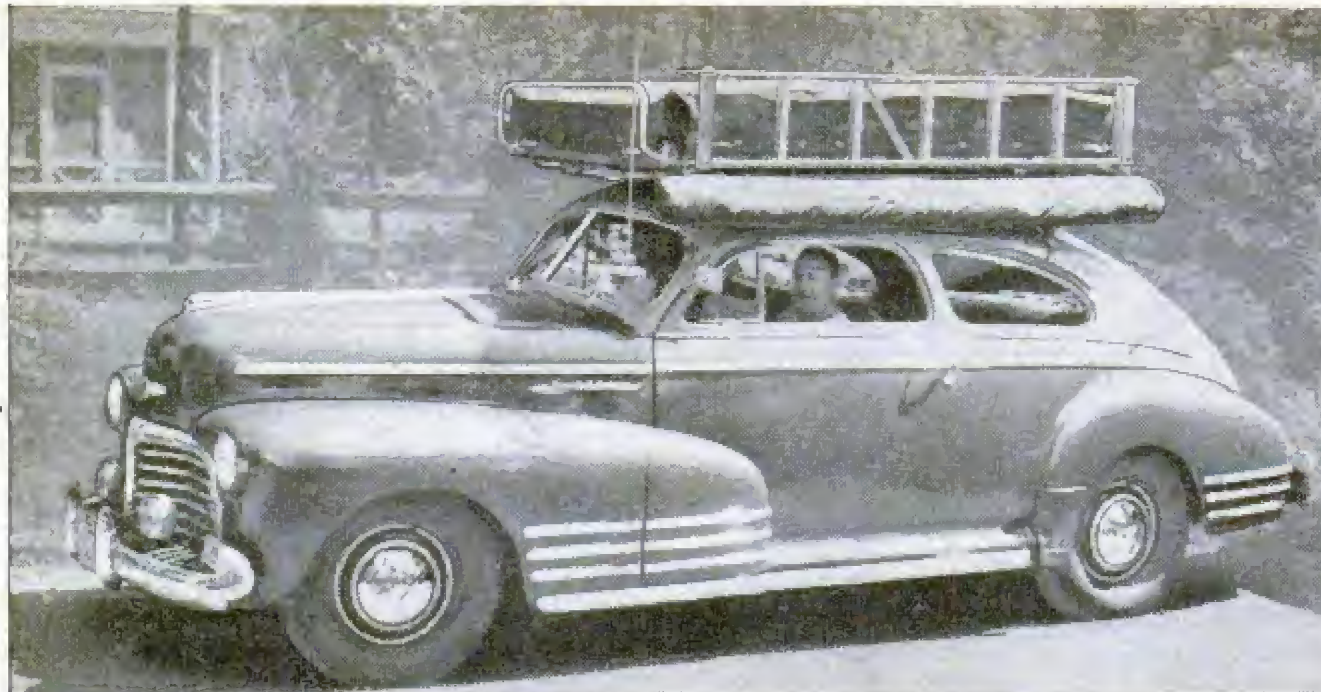
Double exposures are impossible with a new, fixed-focus camera that automatically moves the film forward after each picture is taken. Using 35-mm. film, the camera has an attached outlet for a small flash gun. The bulb is ignited in synchronization with the $\frac{1}{50}$ -second shutter when the release is pressed.

Sterile Corn From Heated Seeds May Help Produce Hybrids

Heat-treated corn seedlings are unable to produce fertile pollen, according to Dr. Donald F. Jones of the Connecticut Agricultural Experiment Station, who suggests that the discovery may be used in breeding hybrid plants where every precaution is taken against self-pollenization. In the experiments three lots of sprouted corn grains were exposed for one hour to temperatures of 104, 122 and 140 degrees respectively. When the seedlings were plant-

ed in fields beside regular plants from the same kind of seed, they grew into stalks averaging 90 inches in height that produced tassels but no fertile pollen. In producing hybrid corn, the tassels often are removed by hand to prevent self-pollenization. The heat-treated seedlings may mean that such methods are unnecessary.

❑Norway now has a railroad that crosses the Arctic Circle.



AUTOBORNE BOUDOIR

Two can sleep in a snug upper-deck "Carbana" attached to the top of a passenger car. The 4 by 6½-foot unit, weighing 150 pounds, rests on six suction standards on the car roof. Constructed for long-distance traveling, it has a canvas cover, with screened windows and flaps that can be battened down tightly against wind and rain. The two mattresses are air-inflated according to the sleeper's weight. When not in use, the aluminum ladder used for reaching the berths attaches to the side. The carborne boudoir's designer plans to build a model to fit atop truck cabs.

Above, upper-deck sleeping quarters safely battened down for travel. At right, the autoborne boudoir's designer climbs lightweight aluminum ladder to bed



Suction Hose Unloads Wheat

Rubber hose is used to unload wheat from freight cars by suction at an Arizona grain company. Previously, flexible metal tubing had been used, but extreme heat resulting from friction between the inner walls and the rapidly moving wheat made it difficult to handle and caused frequent breaks. The new six-inch rubber hose has a smooth lining to permit high-velocity unloading.

Information, including manufacturers' names, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11

ONE BLIZZARD-SWEPT winter night in Colorado, State Patrolman "Boots" Spaulding was driving toward Denver at 2 a.m., several hours after his normal quitting time. Suddenly through the swirling snow he spotted a car stalled beside the road.

Inside the car were a man, his wife and small child—almost frozen to death on a heavily traveled highway. The woman was unconscious and the man was crying. Not a single motorist had stopped in the blizzard to help them. Spaulding took the family to safety. If he had not stopped they might have died or been seriously crippled.

Highway patrolmen of the western states are far more than traffic cops interested only in catching speeders and drivers who are blind to stop signs. The control of traffic is an important part of their job, but a good patrolman in the sprawling West must be equal to any emergency.

His week's work may include such diverse jobs as tracking down cattle rustlers, giving first aid to the victim of a wreck, finding a plane that has crashed, dragging a river for a swimmer who has drowned and finding and arresting law violators from petty thieves to murderers.

Much of a patrolman's routine work, of course, is on the highways that thread his state, and through experience he has developed a knack of judging the flow of

traffic and is able to spot the points where trouble may occur. When a midnight driver went to sleep while negotiating a Wyoming curve at 90 miles an hour, his car crashed end over end into a dry river bed. It was a state cop whose sharpshooting eyes spotted the scarred earth beside the highway and whose prompt action saved the driver's life.

Often a patrolman eases into bed after a full day only to be called upon to drive 50 miles to the scene of an accident.

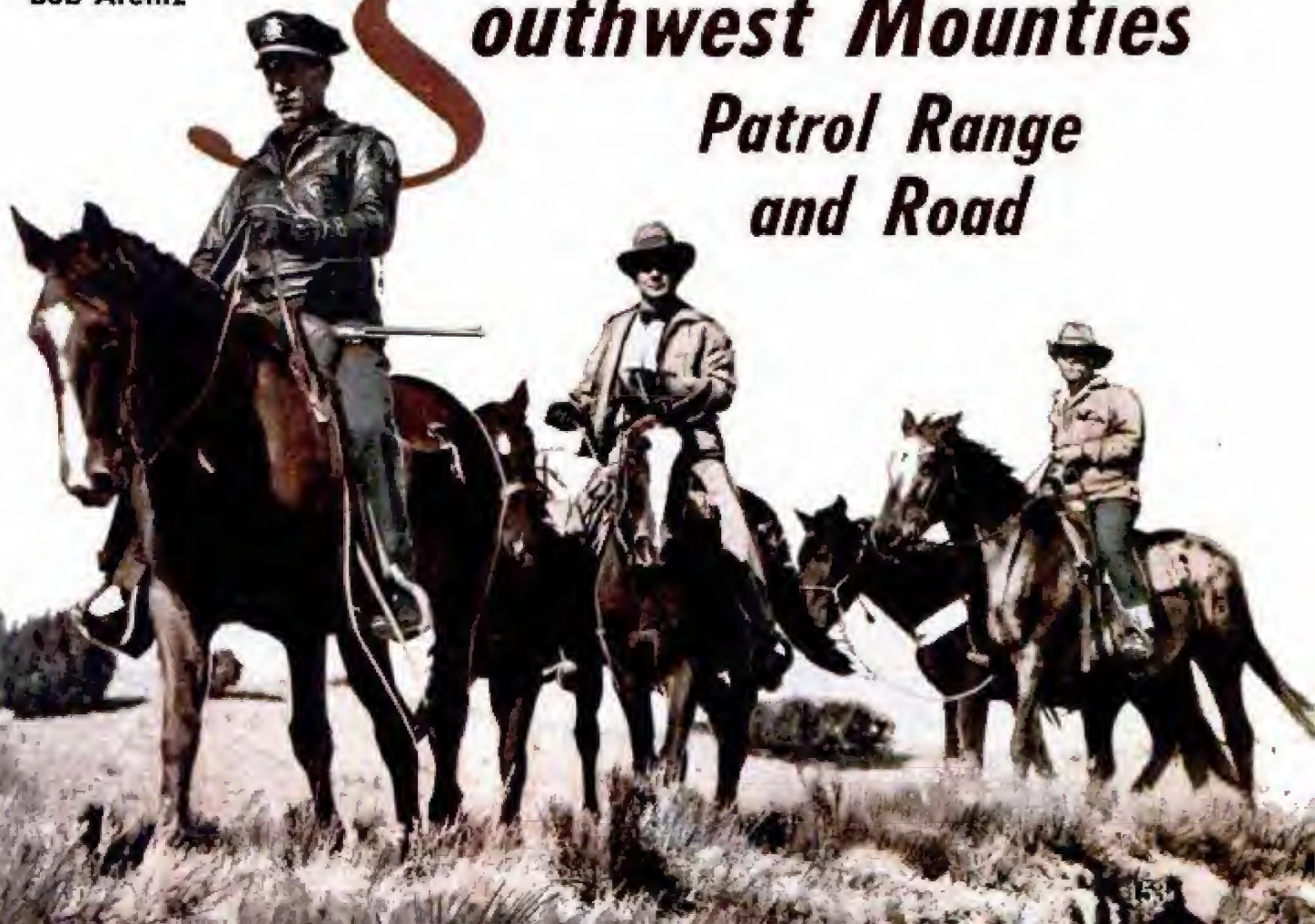
On hit-and-run cases along the highways beyond city limits the major hope for justice is the authority of the state police organization, which can move the length and breadth of the state without conflict over enforcement technicalities that occasionally tie the hands of the county sheriff's investigators. Because the state trooper is not subject to political whim, he has become a specialist in the profession of law enforcement.

Naturally, the police of various states differ in authority and prestige. Troopers in New Mexico parallel the efficient Texas Rangers in police power and jurisdictional rights. In fact, Colonel Homer Garrison, head of the Texas Rangers, was loaned to New Mexico in 1935 to organize the state police.

In Wyoming, only seven troopers were left during war years to patrol the entire

By
Bob Arentz

Southwest Mounties *Patrol Range* *and Road*





Police are trained to breathe life into accident victims with resuscitator

state. New Mexico never dropped below 35 officers, but many of the men were about the only law in their territories, which in some cases equaled in size several of the New England states.

Principal duties vary between the different states. For example, Nevada state troopers team up with county sheriffs in all phases of police work, cracking robbery cases, murders, extortions and cattle thefts. Utah patrolmen, on the other

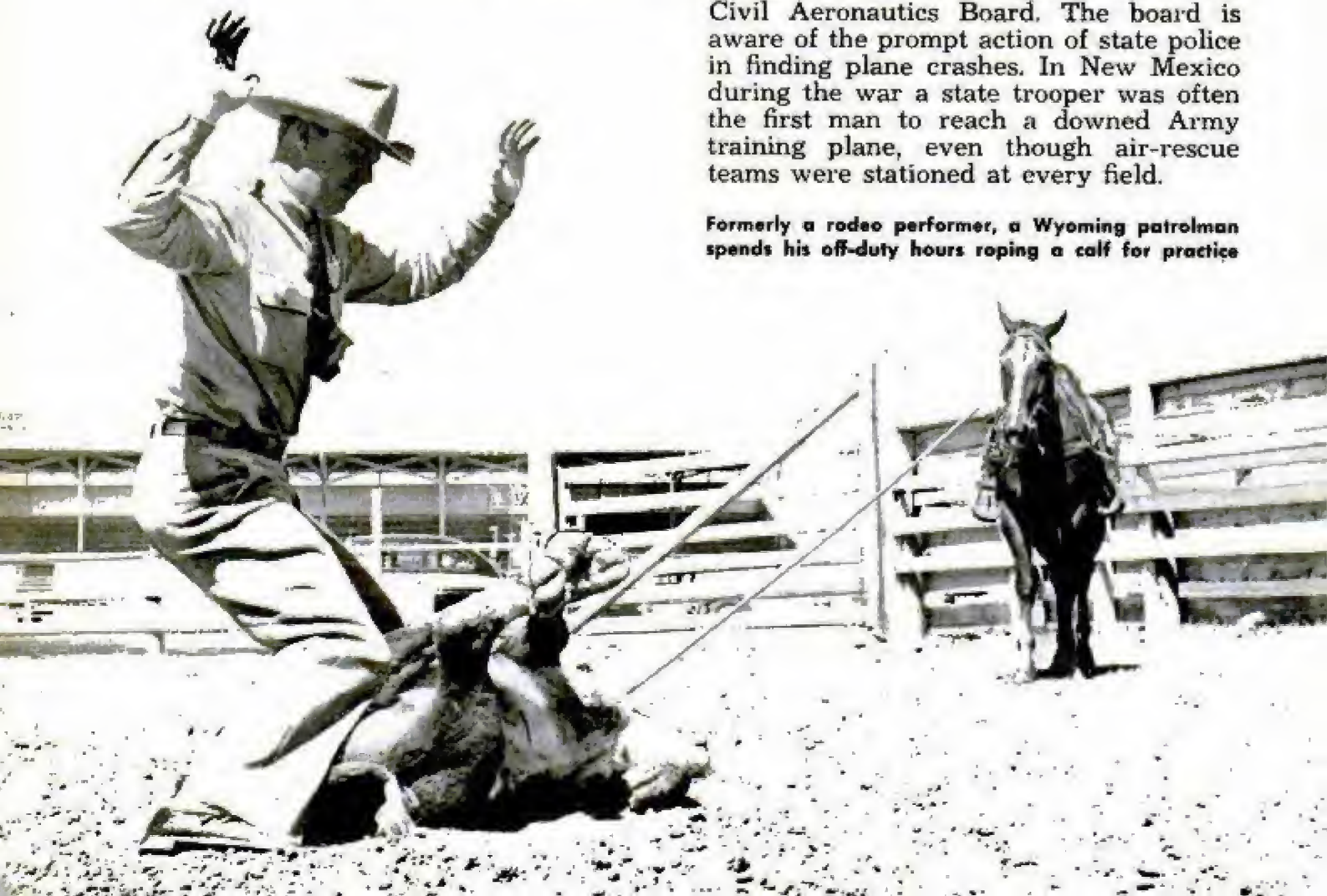
hand, work almost entirely in controlling traffic on the road, bringing to justice speeders, reckless drivers and hit-and-run motorists. Most of the larger Utah towns have fairly large and well-trained municipal police forces which take over the law-enforcement load.

Within New Mexico full credit generally is given to a lone state trooper for bringing down the Mora County homicide rate from a high of 52 in 1935 to a present rate of one or two per year—from among the highest rates to the lowest per capita.

There's been only one major case of extortion in Nevada's history, and the troopers were in on the break. Several months ago, Sergeant Shirley Robison worked with Sheriff Tom McLaughlin's men at Ely to bait the extortionists. And though the Nevada force was limited in manpower, the entire unit came as a group to Ely to help the sheriff spring the trap.

In the office of every state police bureau in the nation are listed the telephone numbers of the Washington office of the Civil Aeronautics Board. The board is aware of the prompt action of state police in finding plane crashes. In New Mexico during the war a state trooper was often the first man to reach a downed Army training plane, even though air-rescue teams were stationed at every field.

Formerly a rodeo performer, a Wyoming patrolman spends his off-duty hours roping a calf for practice





Troopers unload a toboggan stretcher at ski resort. Toboggan is used to handle broken-leg cases on steep slopes

In one period of 30 days patrolman Bill Speight of New Mexico was called first on air crashes that involved the deaths of 150 airmen. By prompt action, driving narrow roads at high speeds throughout the night, he saved the lives of several others who would have died if they had not been found shortly after the crash.

One night Speight was racing against a 40-mile wind toward a flaming wreck when he sensed that there was something wrong beside the road. He slammed to a stop and found a badly injured pilot, fouled in his parachute and being dragged to death across the rugged ground by the high wind. The man was several miles from the crash and would have been lost if Speight had failed to stop.

Budget limitations have

It was a grim task, but patrolman shown here dragged lake 48 hours in search of victims of drowning

prevented any western state from organizing flying squadrons in an effective air war against fast-striking crime. But with young men on the force who were combat pilots during the war, every organization has a few officers who are ready to use their own planes for specialized work.

One "old timer" who has used a plane for years is Lieutenant Jess Miller of the Wyoming police.

Once Miller caught a motorist running





Trooper weighs cargo truck to check conformance with state law

through a stop sign—and made the “pinch” from the air. The trooper was up in his plane looking over a dangerous intersection with an eye to planning more effective controls. As he watched the intersection he saw a driver buzz through the stop sign. The country was flat and smooth so Miller

flew ahead of the car, landed beside the road, flagged down the driver, and handed him a ticket. It's probably the only time that justice struck from the air against a driver who ran a stop sign.

In one wartime winter in New Mexico some of the mountain villages became snowbound and supplies ran low. The state police flew to the rescue in chartered planes, dropping food and medical supplies for two weeks until snowplows could push through the packed drifts.

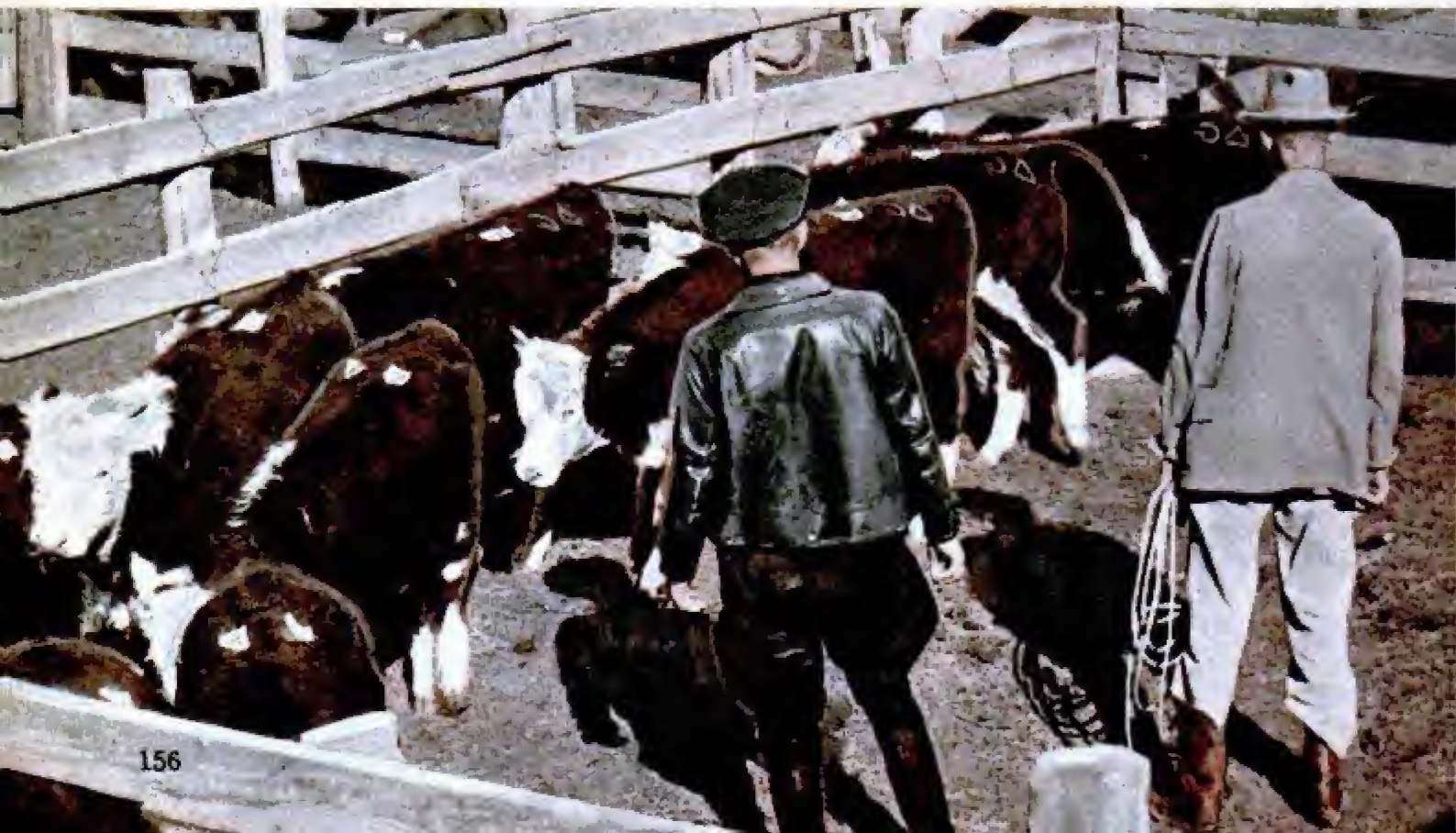
In some states a patrolman is given a territory and expected to police it 24 hours a day. In other states where the police job is mainly traffic control, the trooper may work an eight-hour shift.

Most states prefer young men for recruits but temperament is more important than brawn. A patrolman is a lone wolf in the broad territories of the West, where two officers are seldom seen in one car. He's a direct descendant of the legendary marshals who corralled the western bad men. Though most state po-

lice have radio-equipped cars, the trooper can't expect help quickly when the closest fellow officer may be 100 miles away.

Once Vernon Drain of the Colorado patrol almost became the victim of an angry mob merely because he was doing his duty. Drain was patrolling the highway

State police outwit rustlers and border runners by keeping a careful check on cattle brands in their area



when he found a car piled up beside the road. The injured driver showed all the symptoms of having internal injuries that occur with a broken pelvis. Drain followed his orders—he kept the victim flat and motionless, wrapped him in blankets and waited for a doctor to arrive in an ambulance. Meanwhile well-meaning motorists who had little knowledge of first aid gathered at the scene. All of them wanted to “rush him to the hospital in my car” but Drain took the stand that the man should not be moved. Soon there was an angry undertone to the crowd’s remarks, and Drain found himself facing a mob that insisted he move the man. In the showdown Drain held firm even though there was a threat of violence.

Among the odd jobs that may fall to the trooper are rescuing skiers, checking truck weights, photographing accidents and interviewing Pueblo Indian chiefs.

This last job requires specialized knowledge. Indians often have helped the troopers clear up rustling, murders and smuggling. But in order to get this information the trooper must be able to speak two languages—Spanish, which has become the Indian’s native tongue, and the pure Indian which remains a living part of their language. An Indian may be able to speak excellent English, yet if the trooper comes to him on business he talks the Indian tongue or he doesn’t get the information he seeks.

Vacationists in the West will find state troopers not only the guardians of law and order but trained officers ready to lend a hand at the first sign of trouble.



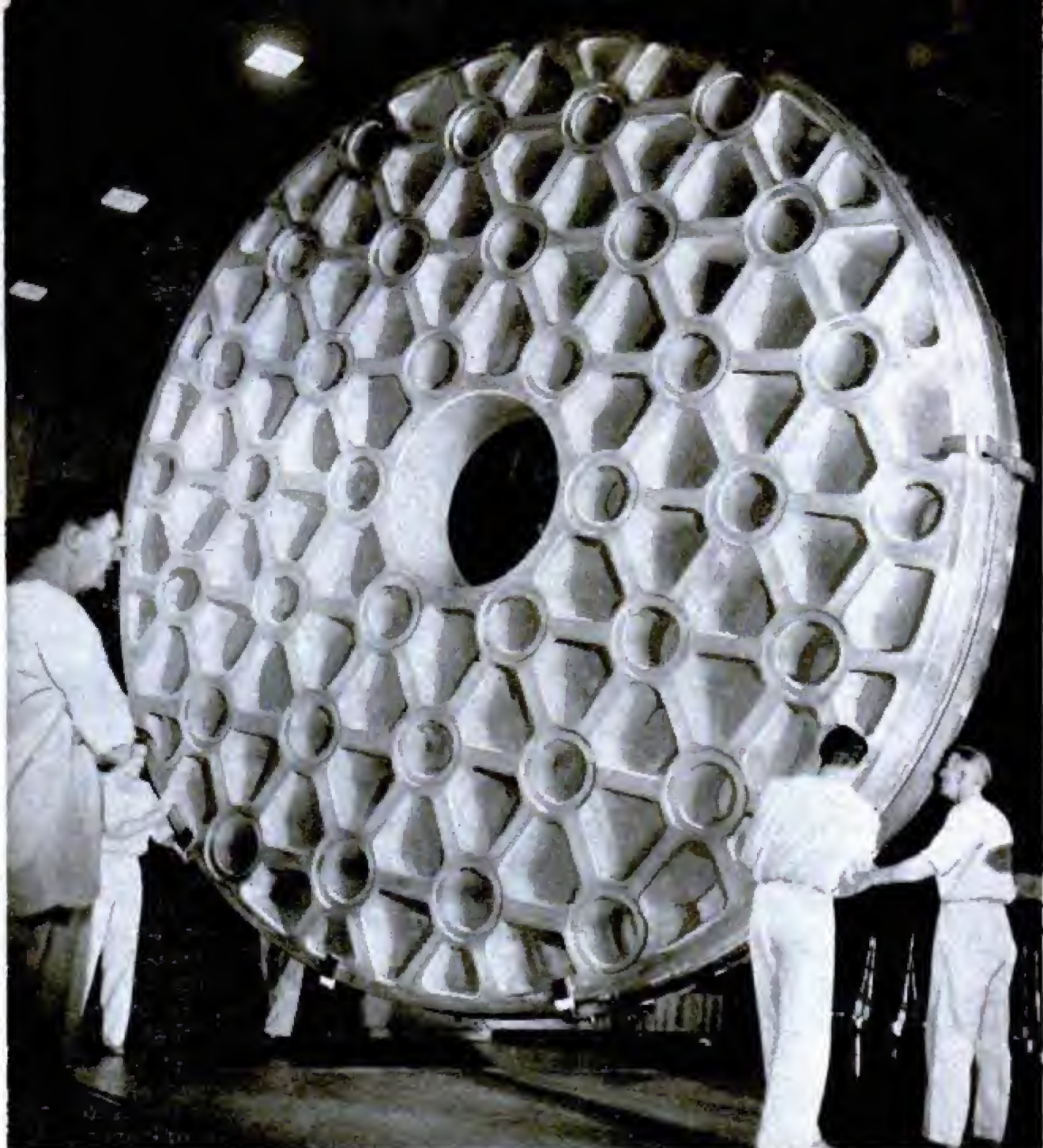
Trooper helps tourists change tire with jack that is kept in patrol car



↑ When accidents occur, this trooper is ready to take photos for evidence

↓ Some officers learn tribal languages in order to deal with Indians





Palomar Mirror Makes Trip in Insulated Box

Ground and polished to within two-millionths of an inch, the 200-inch telescope mirror for the Palomar Mountain Observatory was carefully packed in an insulated wooden box for its trip up the mountain. Under preparation since 1936, the giant

mirror and its supports weigh about 37 tons. Because of the extreme accuracy of the parabolic shape, any scratch would ruin the mirror, so workmen wore dust-proof tennis shoes and special clothing while handling the huge piece of glass.



Rear-Window Wiper Aids Driver

With a blade that flexes to conform to the curve of the glass, an electric rear-window wiper provides the motorist with a clear view to the rear during rain and snow storms. Powered by an electric motor, the wiper is not affected by sudden acceleration of the engine. A single mounting hole and simple electrical connections are all that are required for installation.



Top, stakes lock in place automatically when they are lifted. Top right, tripping bar inserted in one side releases stake on opposite side. Above, trailer rides truck on return trip

Stakes for Logging Trucks Reduce Highway Menace

Logs can't slip off a truck to endanger highway traffic when new stake "bunks" have been installed on the truck. Each stake locks in an upright position when the logs are loaded, cradling the load to prevent any of the logs from slipping. To unload into a river or millpond, the driver pries up a safety catch on each stake. This releases the lock fitted to the stake on the opposite side of the truck and the stake folds down to release the logs. In experiments, truckers found that the stake bunks saved 30 percent loading and unloading time because the logs fit easily into the cradle-type bunks and can be unloaded quickly by tripping the stakes.

Shear Notches Sheet-Metal Corners

Sheet metal is notched quickly by a shearing tool that handles up to 16-gauge steel plate. A 90-degree notch as large as six by six inches can be cut either at the corner or along the edge of the work. The notcher also can be adjusted to cut angles smaller or greater than 90 degrees and can be used for some straight-line shearing. The tool cuts plastics, leather, rubber, aluminum, cobalt steel, chrome molybdenum, leaded brass and stainless steel.

⌚ Electrical impulses generated by radioactive materials can be counted at the rate of 10,000,000 per second by a General Electric electronic instrument called a decade scaling unit.



Silent Sound

Shows Its Muscle



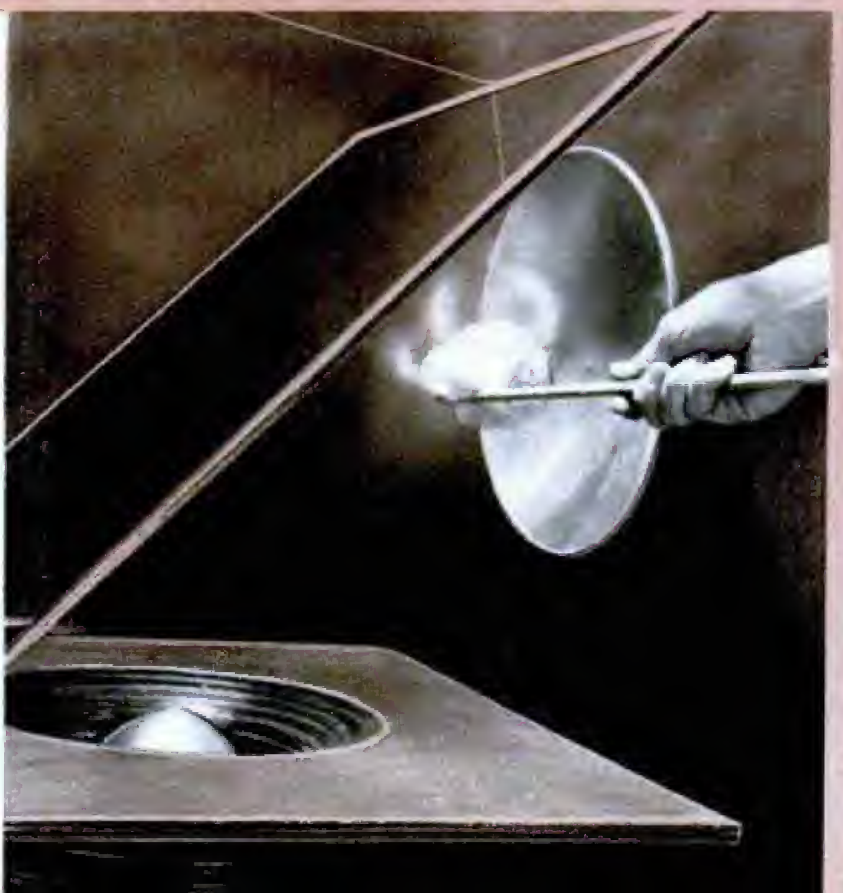
Heated by sound waves, coffee is made in seven seconds by supersonic siren

Not handy to carry in your pocket, the siren will light a pipe (below left). Bounced off a glass plate (right), sound waves are focused by a reflector igniting the cotton wad in six seconds. Steel wool will burn in one minute

SOUND too high pitched to be heard may become the washer-woman of the future. At least, experiments at Pennsylvania State College have proved that ultrasonic waves wash dirty clothes better than present laundry methods. But washing clothes is only one trick the ultrahigh-frequency waves can do.

They also make coffee, light pipes, ignite cotton, pop corn, hold marbles suspended in air as if by magic, and even kill mice and insects.

Producing the silent sound is a lantern-shaped siren that chops compressed air into pulses at a rate of 30,000 per second. As the air escapes through 100 small holes in the siren, a wheel, spinning at 18,000 r.p.m., slices it into individual sound waves.





Pennsylvania State College photo

Only magic here is the magic of sound waves. Glass marbles, almost an inch in diameter, are suspended in air between siren and a reflecting board. For experiment, audible waves were used; workers wore ear plugs



White mice placed in the sound field die after an exposure of one minute. One mouse that survived 30 seconds exposure died the next day because of deterioration of its outer ear.

Insects don't have a chance against the silent sound. Mosquitoes die in 10 seconds. Although the intense heat appeared to be the cause of death, the insects' wings were shattered.

Though effective, the siren is not practical for such tricks as lighting pipes and killing mice. Matches and mousetraps are more suitable. But scientists do see practical uses for it in sterilization of food, homogenization of milk, elimination of smoke in large cities and industrial areas, and treatment of seeds to increase crop yield.

Supersonic washer is merely a pan placed above the siren. Microphone above it measures sound





Left, a supersonic guidance device detects obstructions and warns the user by changes in earphone signals. Right, the electronic pencil "reads" printed letters and translates them into sound for the blind person

Sonic Aids for the Blind Permit "Seeing" by Ear

Electronic "sound-readers" for the blind may some day replace the Braille system. Under development at the University of Michigan, an electronic pencil converts the printed letters into sounds. These sounds vary for each letter and the blind person learns to identify them and thus to read. An improved model will actually read to the user, pronouncing the letters rather than making identifying sounds that must be memorized. The pencil,

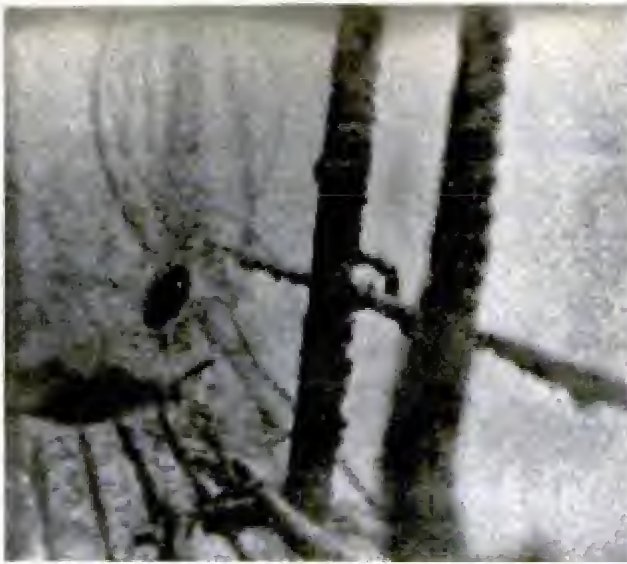
slightly larger than a fountain pen, contains a photoelectric cell that scans the printed lines. Sounds are amplified into a hearing-aid earphone. Another aid to the blind is a supersonic guidance device that sends out inaudible sound waves. These waves bounce back from obstructions in the path and the user detects these obstacles by sound changes in the earphone. Its major defect is that it does not warn the user of holes or depressions in the surface. Neither device will be available to the public until further development and production methods are completed.



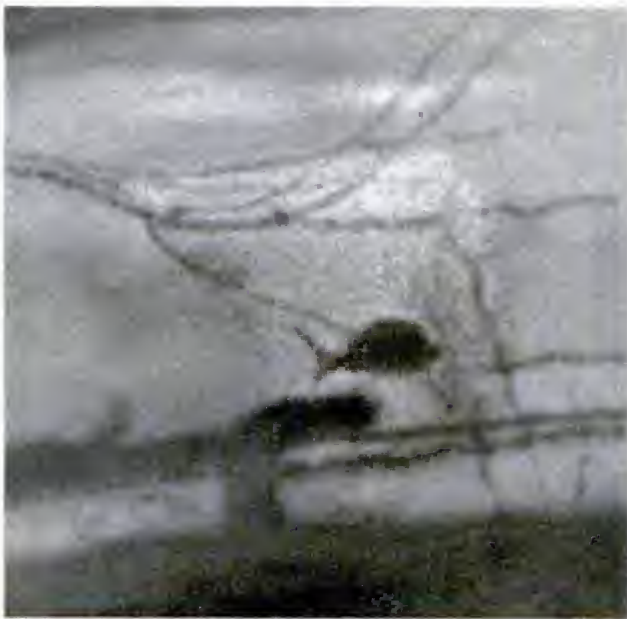
Room Service by Tricycle

Hot food is pedaled to guests of the Williamsburg Inn at Williamsburg, Va., in a "foodmobile" made from a bicycle. The mobile serving unit carries food to guest houses some distance from the dining room. Designed by staff members, its three wheels support a large storage compartment. The top section holds trays, linen and dishes while the bottom section stores room-service containers which are kept warm with canned heat.

☛ There are three pints of water, half a million bacteria and about 1200 billion dust particles in the air in your living room on a sultry summer day.



Official Navy photos



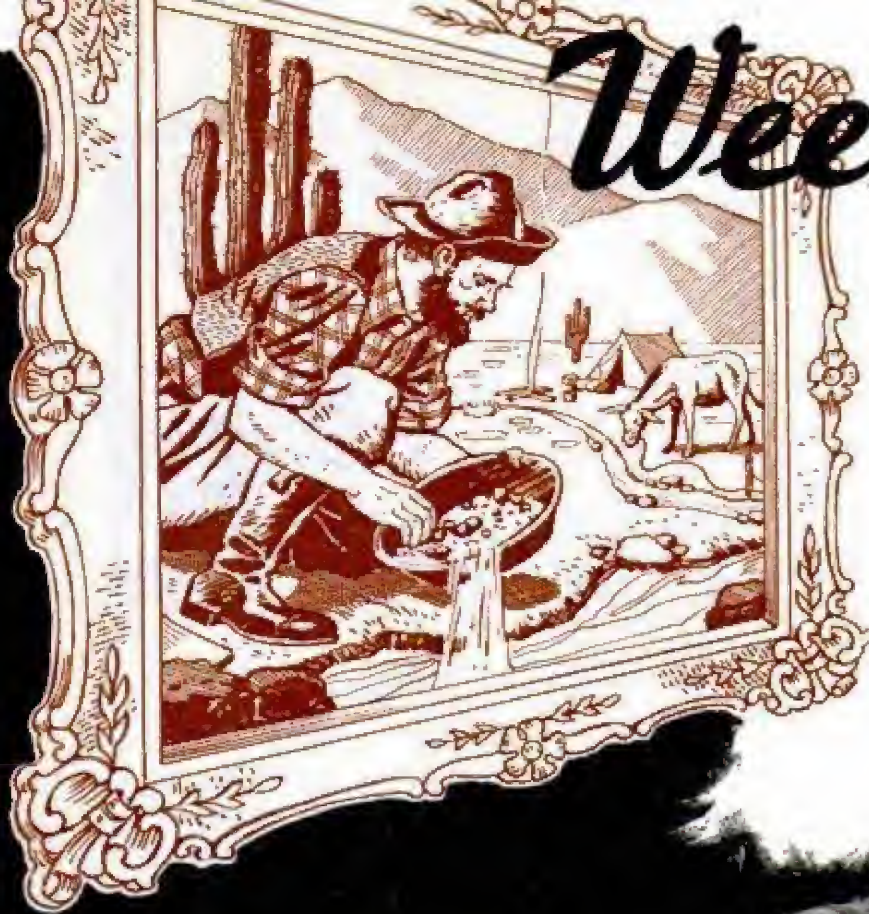
Televising Fish at Play 160 Feet Below Surface

Television that permitted scientists to watch fish 160 feet below the surface at Bikini has opened a new field in deep-water investigation. It may make possible exploration of vast craters and plains on the ocean floor, which divers are unable to reach because of water pressure. The television camera was in a steel housing, with a glass in its cover, and remotely controlled and focused from a surface vessel. The equipment, which can be used with regulation diving lights, is similar to that used for observing instruments in drone planes. It was adapted for the test by the Cornell University aeronautical laboratory.

JUDGES "RISE TO THE OCCASION" at a West Virginia race track when the steeds begin to run. For a better view, their stand is hoisted eight feet above its foundation by a foot-thick steel cylinder. The stand is actually a four-ton peaked roof "cottage," with a porch all around and flower boxes on the railings. Two guide rods telescoping into cylinders in the foundation prevent the stand from swinging around during ascent and descent. The main lifting cylinder, controlled by push buttons, is powered by an electric oil-pumping unit



Weekend 49ers



Some folks fish on week ends, others play golf, but these amateur prospectors dig for the "gold in them thar hills"

JUST one hundred years ago, a man from New Jersey, working on a sawmill in California, picked some yellow flakes of metal from the water in the millrace. It was gold, and in a few months the news had spread over the world. The Gold Rush was on!

Today hundreds of prospectors are still going over western hills looking for a lucky strike. But this time it's a part-time project, more a hobby than a business, of weekend prospectors who live in town, hold steady jobs during the week, but on spare time head for the hills.

Gold is only one of the minerals they're looking for. Industry needs more and more fluor spar, manganese, antimony, barium and cadmium, to mention only a few minerals, and weekend 49ers are combing the hills for new supplies.



Prospector crushes white quartz before testing for gold content by swirling it in water in frying pan

One prospector, a lithographer by trade, discovered an extensive deposit of lead on one of his trips and more recently has uncovered material that promises to yield tungsten in commercial quantities. Another, a 23-year-old mineralogy student, has staked his claim on deposits of gold, silver and zinc in the past year.



Prospecting may be fun, but there's work involved. Ore is broken loose with a pick and lots of muscle

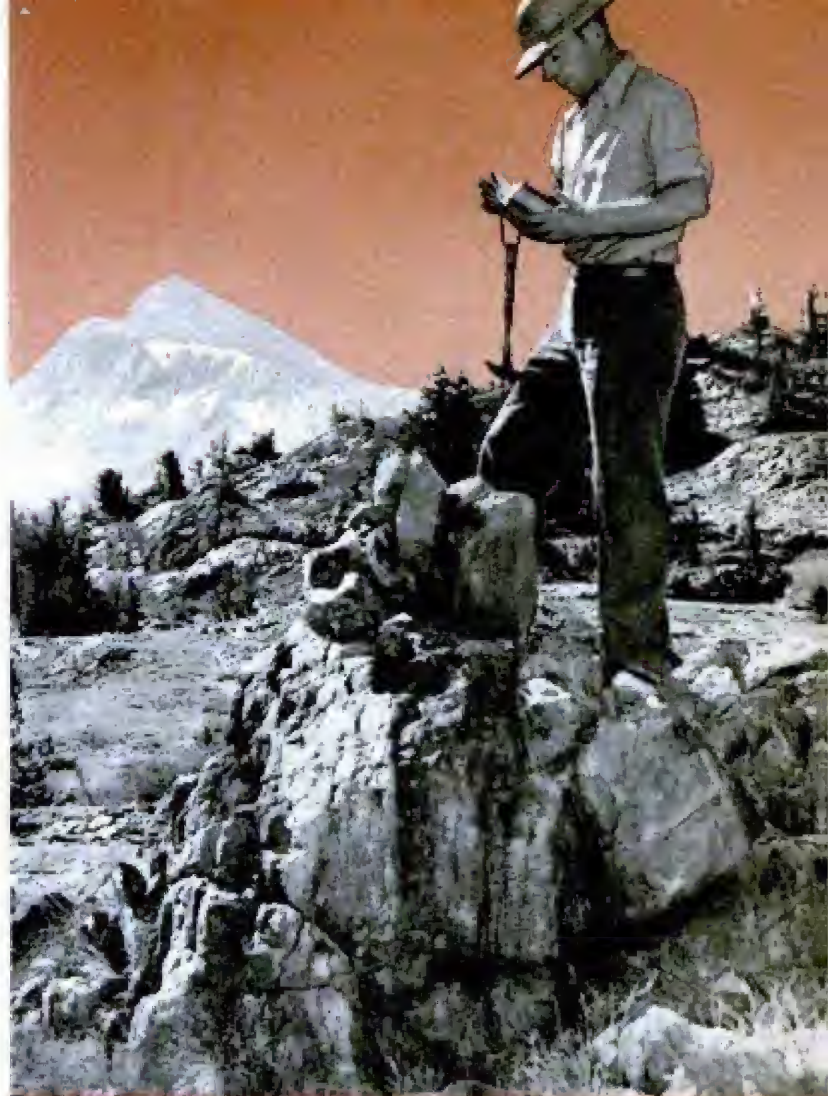
Just before the war, a resident of a small town on the Oregon-California border found a ledge of quartz that carried a trace of gold. After his discharge from the service, he went back and tunneled into the vein. It became richer and richer as he dug. Today he owns a valuable mine and digs out a hundred or a thousand dollars' worth of gold whenever he wants it.

This past year another prospector, working the Death Valley region, found a deposit of ore so rich in silver that a ton yields \$12,000. It was a lucky find, made when he investigated a ledge that previous prospectors had passed by without bothering to test completely.

Prospectors combed the West thoroughly in the old days, but they missed many valuable deposits. Some ores were in forms they didn't recognize, some were too low grade for mining at that time, others were minerals that had no value then.

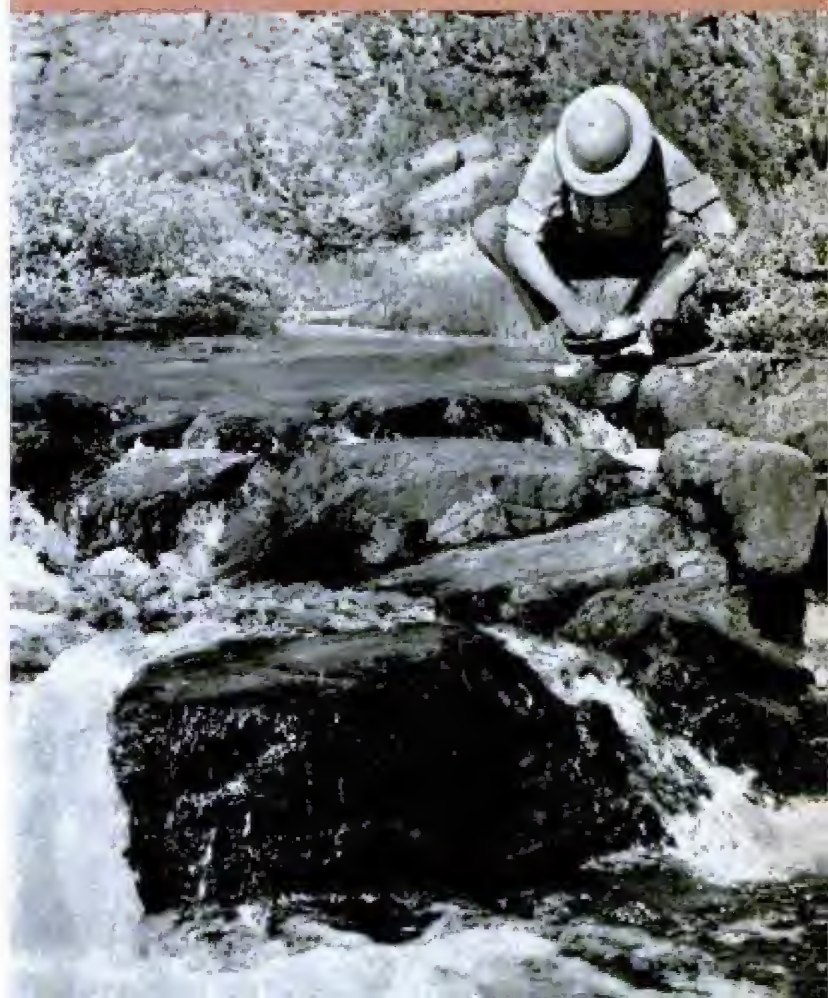
Rich strikes are infrequent among the weekend prospectors, but there's always a chance that one might come. During the week they study mineralogy so they won't miss the big one when it comes along. Night-school classes on the subject are held in several western cities. Last winter in Los Angeles the Mining Association of the Southwest held a public lecture series, during which assayers, mining engineers and veteran prospectors explained how to find and identify valuable minerals.

Students in prospecting schools are



↑ Amateur prospector places his discovery notice in tin can he will leave on stone monument at ore vein

↓ Skillet is used to pan for gold carried in stream





Carried up the trail in sections, a portable "high line" is used to haul mining tools up to the vein

taught basic geology and the rudiments of "skyline prospecting" by which the mineral possibilities of a region may be judged from the contours of its peaks and valleys, viewed from a distance. They learn to look for minerals in formations that are highly colored or that appear different from the surrounding rock and they learn that a change in vegetation or an abrupt absence of it may indicate a mineral deposit.

They learn that prospecting is not so easy as it sounds. Many common nonmetals such as clay or pumice can be recognized almost at a glance, but many metals are found in ores that to a beginner appear to be worthless rock. Other rocks that look valuable prove worthless.

In most cases metallic ingredients can be concentrated by pulverizing the ore in a mortar or on a flat stone and then panning the material in a gold pan or gold horn or even a clean frying pan. Light materials are swirled and sluiced away. The heavy particles that remain are identified by various physical or chemical tests. To test for copper, for instance, nitric acid is poured on the sample, heated, cooled, diluted with water, and then ammonia is added. Copper is present if the solution turns blue. Gold usually can be recognized by its color, by the fact that it doesn't change color wet or dry or when moved around in the light, and by its softness. Gold doesn't shatter when struck by a hammer.

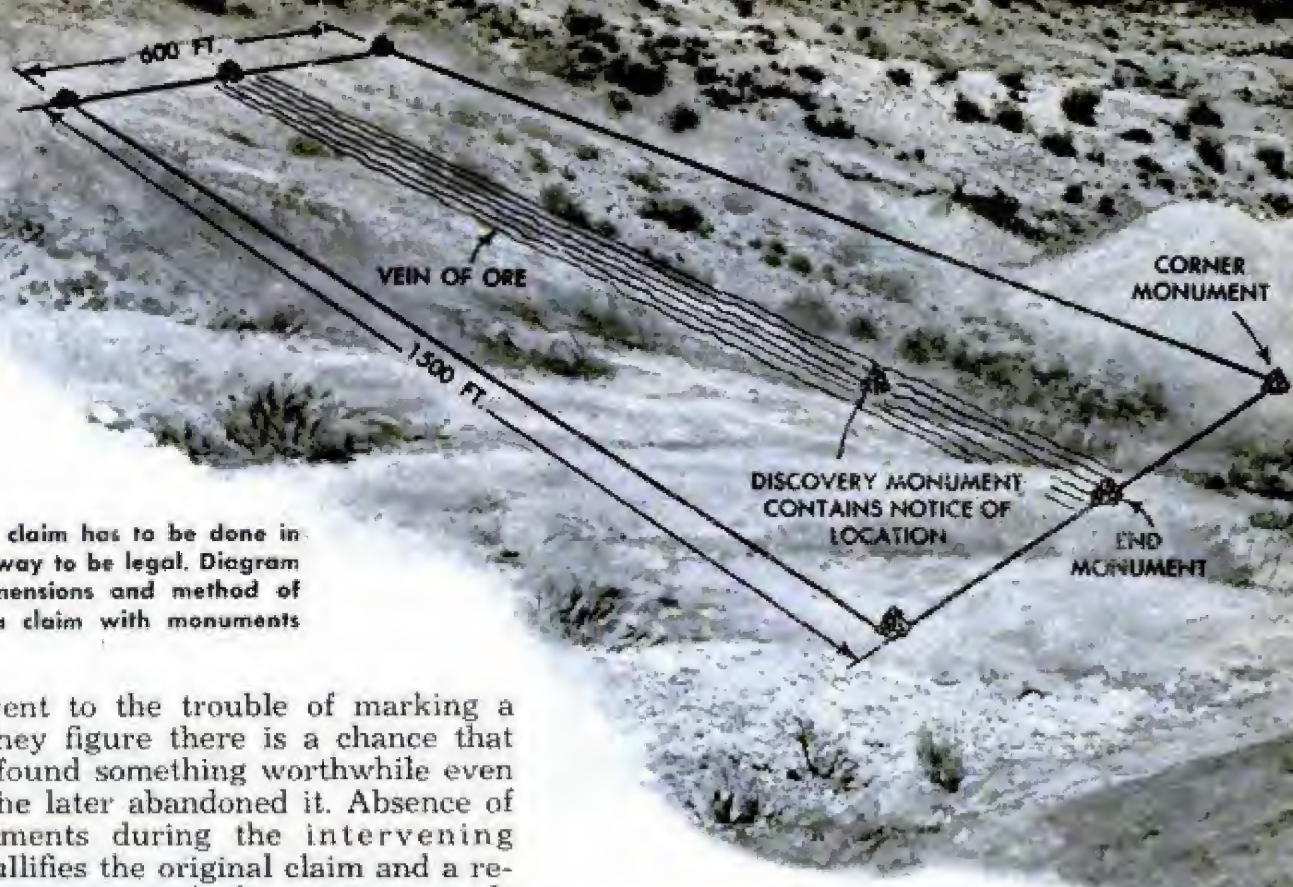
Student prospectors are warned that their own tests are apt to be unreliable and that they should submit their best samples to a reputable assayer. A trace of iron, for instance, can provide misleading results in a simple field test for a more valuable metal. Assay costs range from \$1.50 to \$4 per test. Spectrographic analysis at from \$7 to \$10 per sample shows all the metals that are present and gives some indication of the quantities.

Some part-time prospectors specialize in looking for rock monuments erected years ago by early prospectors. If an old-

Stubborn pack mules, essential to the original 49ers, are not needed by weekend treasure hunters. They prefer Army surplus vehicles with low gear ratio and four-wheel drive



Staking a claim has to be done in a certain way to be legal. Diagram shows dimensions and method of marking a claim with monuments



timer went to the trouble of marking a claim, they figure there is a chance that he had found something worthwhile even though he later abandoned it. Absence of improvements during the intervening years nullifies the original claim and a re-discoverer can search the county records to make certain that he is not "jumping" another's property.

The laws that govern prospecting are complicated and sometimes confusing. If you plan to do serious prospecting in a certain area you should obtain from your state mining bureau a digest of the federal, state and local laws that apply to the region.

Most public land in the United States, including most national forests, is open to exploration for minerals. Deposits of met-

als such as gold, molybdenum and tungsten, and nonmetallics such as gypsum, fluor spar or silica may be claimed outright. Ground containing coal, petroleum, oil shale, potash, phosphate or sodium salts may be worked only under federal lease. Private mining of public land containing radioactive minerals has been forbidden. In addition, prospecting is not permitted on Indian and military reservations, lake

(Continued to page 256)

Left, ore sample is placed on a block of charcoal and metal is melted from it by intense flame of blowtorch. Right, another test for valuable metal content consists of treating the raw ore with three different acids





Mixer Delivers Supply of Plaster To Trowel Continuously

Plasterers don't waste time waiting for material when they use a machine that delivers ready mixed plaster to the face of the trowel. The device, called a "fountain trowel," consists of two 38-gallon mixing tanks with revolving paddles that thoroughly mix a 100-pound bag of plaster in ten minutes. A 2½-horsepower gasoline motor powers the machine and operates an air compressor. The compressed air forces the plaster through a 1¼-inch flexible tubing to the trowel. Rate of flow of the plaster is controlled by an adjustable valve in the tube held in the left hand. A narrow slot in the face of the trowel feeds the plaster against the lath. Because it eliminates time spent by the plasterer refilling his hawk, the machine makes plastering four times faster and can be used on any type of lath. It is, of course, suitable for stuccoing too.

Indexing Device Speeds Filing

Office correspondence and forms are sorted rapidly by means of an indexing device that provides four convenient sorting classifications. The four classifications are an alphabetical index broken down into 31 divisions based on frequency of use, a numerical index from 1 to 31 for the days of the month, a monthly index and a second numerical index arranged by fives from 5 to 95. The 31 aluminum tabs are indexed on both sides. A rack is available for use with the sorter to attach it to the edge of a desk or table at any angle from 15 to 45 degrees.



Duster Worn Like Knapsack

Weighing less than eight pounds, a hand-operated duster uses a powerful bellows to spray powdered insecticide on plants and shrubbery. Operated by the right hand, a lever pumps the bellows to provide the air blast for spraying. The aluminum duster holds 20 pounds of powder and is worn like a knapsack.

DDT Kills Crop-Destroying "Fish"

Southern farmers are doing some dry-land "fishing" in defense of young cotton, soybean and grain plants. They're using DDT-poisoned bait to kill crawfish that burrow in fields where the water table is close to the surface. As many as 50,000 live in a single acre and they devour everything in sight. Cottonseed and ground-up corncocks soaked in DDT solution are proving the best bait.

Rail-Cycle in Mine Tunnel Cuts Transportation Time

Mine foremen and repairmen in western metal mines save both time and energy by pedaling along haulage tracks on a combination bicycle and handcar. Wire spokes in the flanged wheels make the mine cycle light enough so one man can lift it off the tracks when a train approaches. A wire basket between the front wheels is used for carrying small articles into the mine.

Exposure to Air at 75,000 Feet Fails to Kill Animals in Test

What will happen to airplane passengers flying at extreme altitudes if the pressure system suddenly fails? That question perplexes the designers of tomorrow's planes. In probing for the answer, Yale scientists have found that explosive decompression—sudden loss of air pressure—doesn't kill animals even at 75,000 feet. They learned that if a rat is promptly recompressed, its breathing recovers spontaneously after 18 seconds, and the heart beat is resumed. If the rat is not brought down to sea level quickly, however, it dies. Breathing stops at all levels above 52,000 feet after 18 seconds, because at this height barometric pressure equals



the vapor and carbon dioxide pressure in the lungs of all mammals, and no oxygen is available to the lungs. Research is continuing with monkeys to get data more readily applicable to humans.



"Bomb" on Sailplane Shows Glide Angle

Odd-shaped scientific instruments are being used by Dr. Gus Raspet of Long Island, N. Y., a glider pilot, to check the performance characteristics of sailplanes. One instrument, shaped like a miniature bomb, is trailed from the glider to measure the gliding angle while the plane is in level flight. Another instrument measures instantaneous air temperature, which is virtually impossible to obtain with other devices. A long rocketlike instrument is trailed from the sailplane to measure air speed. Drag effect is checked by a wake-survey comb.



Armed with DDT, inspectors wage war on foreign insects arriving on incoming plane. Below, expert identifies a little-known species

Hitchhiking Insects Forbidden



By Andrew Hamilton

WEARING a beautiful corsage, a well-dressed matron stepped off the Havana plane at the Miami airport. She was stopped by an inspector from the U. S. Department of Agriculture.

"Sorry, madam, but we'll have to confiscate your corsage," he said politely and explained why.

The woman protested, but the inspector had orders to confiscate, examine and destroy all suspicious plant and animal life entering the United States from abroad.

As he took the corsage, the inspector heard the lady muttering to her husband that it was a pity the government spent so much time harassing honest citizens. Why wasn't it out catching crooks instead of worrying about a few bugs?

What she didn't know was that these little bugs—and there are 50,000 species in this country today—are dangerous

U. S. Dept. of Agriculture photos





Inspector checks cotton packing in gift box from abroad for possible discovery of pink bollworm, a pest not yet found in our cotton fields

"crooks." They do 1½ billion dollars worth of damage every year. If it weren't for the vigilance of the Bureau of Entomology and Plant Quarantine inspectors, we'd have a lot more of the world's 700,000 species of insects and destruction figures would soar.

With four-motored planes winging passengers and cargo around the world these days, the problem of hitchhiking insects has become serious. Pests that might not withstand a long sea voyage survive a short air hop, arriving ready to go to work—and their work is destruction.

The problem is becoming more serious every year. During 1941, for example, approximately 11,000 planes were inspected upon arrival from abroad. In 1946 the total jumped to nearly 59,000 planes. Look at it another way: 259,945 passengers, 452,589 pieces of luggage and 96,035 pieces of air cargo in 1946 produced 12,156 specimens of prohibited material and 3368 insects from diseased plants—a 66-percent increase over the previous year. Unintentionally, civilian aviation has produced a real threat to American agriculture.

To guard against this invasion, a staff of inspectors is maintained by the Department of Agriculture at principal ports, railway stations, highways, post offices and airports. To intercept airborne insects alone, 200 inspectors are on duty at 45 major airports.

The plant quarantine law authorizes the Secretary of Agriculture to quarantine all plants and plant material that might carry disease or insects in any stage of their life cycle. Certain fresh fruits and vegetables such as oranges and avocados are prohibited outright; other plants such as cotton and broomcorn are permitted entry after fumigation; still others such as nursery stock, seeds and bulbs are passed under permits and after inspection.

Inspectors are chosen carefully. They are insect experts, university graduates with degrees in entomology and a knowledge of botany—especially plant pathology.

Working in pairs, one inspector carries a flashlight while the other uses a DDT-pyrethrum aerosol bomb.



EUROPEAN CHERRY FRUIT FLY



CARNATION THRIPS



MEXICAN FRUIT FLY



PINK BOLLWORM



EUROPEAN PEA WEEVIL



Wilted orchid corsage found in plane arriving from Central America will be taken to an incinerator at once for burning



Above, incinerator at New Orleans airport is used to destroy prohibited materials. Below, oranges get careful inspection



Doors and cargo hatches are inspected and sprayed before being opened to prevent escape of any insects hiding in the cracks and to seal in what insects are inside.

As passengers alight and their baggage is opened, the inspectors search for corsages, bouquets, fruits, vegetables, nuts, seeds or any other plant and vegetable material. Servicemen and tourists returning from overseas are often dismayed to find that items they bought abroad are confiscated. Grass skirts from Hawaii, cotton stuffing in carved wooden boxes from Italy, Chinese dolls stuffed with rice straw and Mexican beads made from seeds are only a few items on the prohibited list.

Plane interiors are also carefully examined and sprayed. Insect pests have a way of hiding in cracks and dark corners and unless promptly killed they are likely to escape.

Suspicious material is examined under a microscope. Oranges and tulip bulbs are sliced open, beans shelled. Common insects are identified and the plant burned. Uncommon or unrecognized insects are dropped into a bottle of alcohol and shipped to the Division of Insect Identification at the Department of Agriculture's Research Center, Beltsville, Md.

In the fight against airborne insect pests, the most potent weapon is the DDT aerosol bomb. Seven strokes of the plunger atomizes seven drops of the liquid (DDT and pyrethrum in solution), enough to spray 1000 cubic feet.

Some foreign insects that have entered the United States, causing millions of dollars damage, include the Hessian fly, the Japanese beetle, the European corn borer, the gypsy moth, the Oriental fruit moth, the Mexican bean beetle and the boll weevil.

In dollars and cents, the losses are enormous: in 1945 the damage to the cotton crop by boll weevils was 639,000,000 pounds worth approximately \$170,000,000; the European corn borer cost the American farmer \$22,700,000 in 1944, \$37,000,000 in 1945 and \$50,000,000 in 1946. Someone has stated that in a six-day week the farmer works four days to feed himself and his family and two days to feed the insects on his farm.



Above, English tulips found in baggage are confiscated. Below, inspector sprays baggage compartment door before he opens it

When foreign insects do get a foothold here, the bug experts of the department go to work on the problem of eliminating them.

The cottony cushion scale from Australia invaded California's citrus orchards. It spread rapidly and many orchards had to be destroyed. Sprays and oils were ineffective because the eggs are protected by a white, cottony layer. The government sent an expert to Australia to find a parasite that would battle the destructive pest. The *Vedalia* beetle, sometimes called the lady-bird beetle, was brought to this country and it has stripped its natural enemies from the citrus trees saving the growers many dollars.

Florida had an invasion by the Mediterranean fruit fly. A ban was clamped on all shipments until the vapor heat treatment for oranges was devised. The fruit is held at 110 degrees for eight

(Continued to page 240)





Muffler Silences Model Planes

Model-plane engines can't be heard 100 feet away when they're equipped with a muffler invented by Marty Johannes of Burbank, Calif. He made it for his son after police chased the boy and his friends from a public playground because their plane's engine noise was a nuisance. The aluminum muffler is 10 inches long and weighs 3½ ounces.

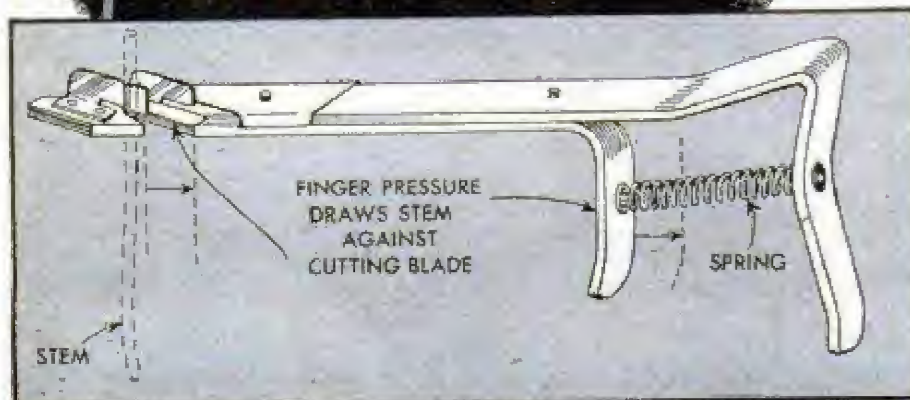
Score Card Fits in Putter Head

Golfers who habitually fumble for score card and pencil after each hole have an answer to their problem. A new putter has a head which contains the score card and a pencil or ballpoint pen. The 18-hole card slips into grooves in the back of the blade, which is curved to hold it in place during play. The pencil fits into a hole in the base of the club where it is held by a spring.

Flower Cutter Holds the Stems



Flowers are cut and held by the stem with a new-type flower cutter that prevents scratches from thorns. The gardener holds the cutter so that the stem of a standing flower slips into a notch near the end of the tool. Then he compresses the handle to cut the flower and hold it until he releases the handle. Flower stalks are not damaged by the cutter.



You may wish to obtain additional information about new products described each month in Popular Mechanics. If you want to know the name and address of the manufacturer or distributor, just write Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois

Electric Bed Sheet Can Be Laundered

Made of muslin, an electric bed sheet is used with conventional bed coverings to maintain an even temperature. The sheet, 84 inches long by 70 inches wide, is spread on top of the regular bed sheets and covered with a blanket or quilt. A thermostat maintains the heat at the desired temperature. The sheet can be laundered, as all electric elements are waterproof. Seventeen buttonholes around the edges permit the sheet to be buttoned to the blanket or quilt.



Colored Egg Whites

Chickens fed certain kinds of food lay eggs in which the whites are pink and the yolks are dark orange-yellow or olive colored. Egg whites turn pink if hens eat hollyhocks or cheeseweed. Pink-tinged whites also result if hens feed on cottonseed meal and the eggs are kept in storage for a while, according to Clyde Driggers,

poultry expert at the Florida Experiment Station at Gainesville, Fla. Yolks become dark orange-yellow by feeding cornmeal or alfalfa-leaf meal. Too much cottonseed meal colors the yolks a dark olive.



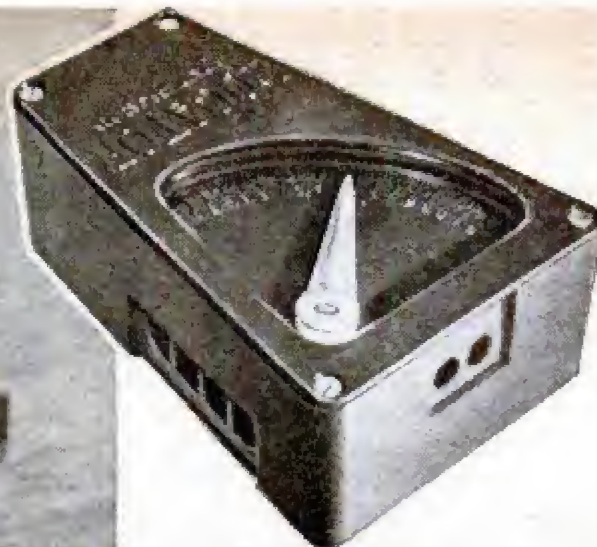
Reel Assures Straight Garden Rows

Two stakes, an aluminum reel and 150 feet of cord assure gardeners of straight rows in planting their vegetables. The cord is wound on the reel which is attached to one of the stakes. On the same stake is a simple lock which holds the string taut at any desired length.

Press Seals Papers in Plastic→

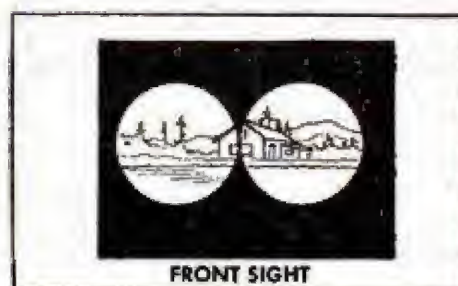
Photographs and valuable papers can be sealed in plastic with a laminating press that develops up to six tons of pressure. The paper or other flat object to be sealed is placed between two layers of plastic and the "sandwich" inserted in the press. The platens are tightened and the press is heated in a gas oven or over a burner. The plastic melts to seal the paper. The press handles objects up to four by five inches. It also can be used to make jewelry.



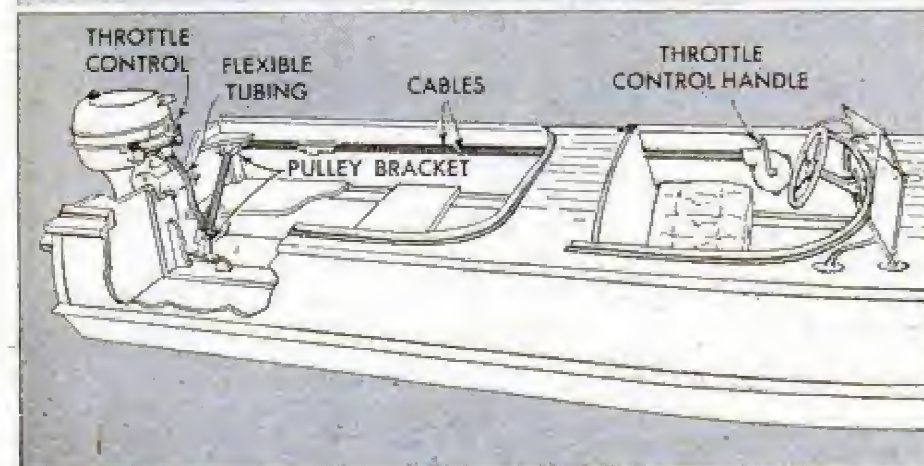


Spotter Marks Place Where Fish Bite

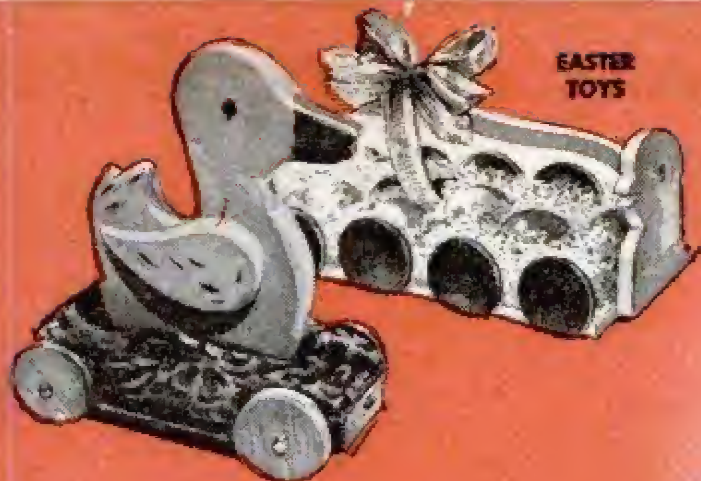
Returning to that spot on the lake where fish are plentiful is made easy by a fish-hole locator that operates by triangulation. The small, plastic locator provides a simple method of exactly relocating any spot. After aligning two objects on the shore through the front and right sights, the fisherman plots his location by reading the locator scale on top of the instrument. He can return to the exact spot by setting the pointer at the previous figure on the scale and resighting on the two objects. The pointer controls the position of a mirror inside the spotter making it possible to sight to the front and side through a single rear eyepiece.



Remote Control Synchronizes Outboard Motor's Spark and Throttle



Operating the throttle of an outboard motor from the forward part of the boat is possible with a remote-control system that functions through cables and pulleys. The control automatically synchronizes the spark and throttle. A handle near the operator's seat is connected by cable and pulley to a bracket below the motor in the bottom of the boat. Flexible tubing carries the controls to the motor, where the spark and throttle are synchronized. Moving the handle transmits a change in throttle speed to the motor. The control system can be installed and attached to the motor without drilling.



EASTER
TOYS

The CRAFTSMAN

★ We are proud to present "Sea Craft"—a 25-ft. cabin cruiser. She is a sound and seaworthy boat with a low streamlined cabin that sweeps into the hull lines fore and aft. A converted auto engine pushes her along at a 15-knot clip. Part 1 of the story telling how you can build this boat yourself begins on page 218.

★ A timely article featuring novel toys and egg baskets for Easter appears on page 196. Made of wood, these toys are good one-evening projects that will delight your youngsters.

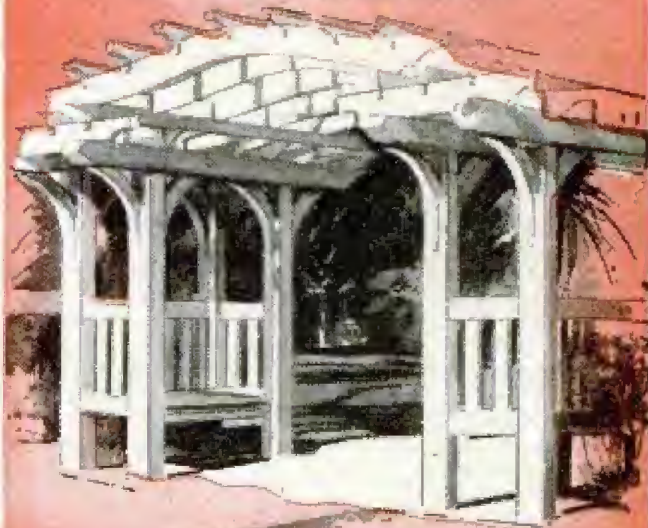
★ With the spring season at hand, it is time to think about arbors and pergolas. A story starting on page 186 gives a few attractive designs.

★ Practical shop feature for the month, page 210, goes into approved methods of laying a hardwood floor.

★ On pages 242 and 244, the Home Clinic Editor answers several questions that have presented problems to some of you readers.



LAYING
HARDWOOD FLOORS



ARBORS AND PERGOLAS

25-FT. CABIN CRUISER



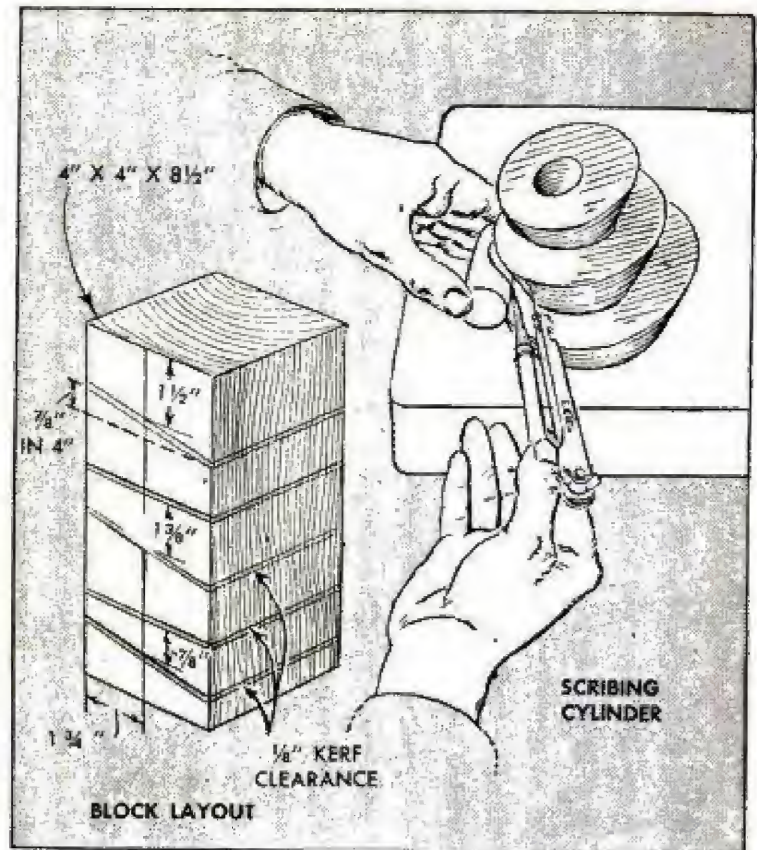
Turned Candlesticks in New

These modern candlesticks, in novel "climbing spiral" design, offer something new in one-evening projects for the wood-turning hobbyist

By E. M. Lowe

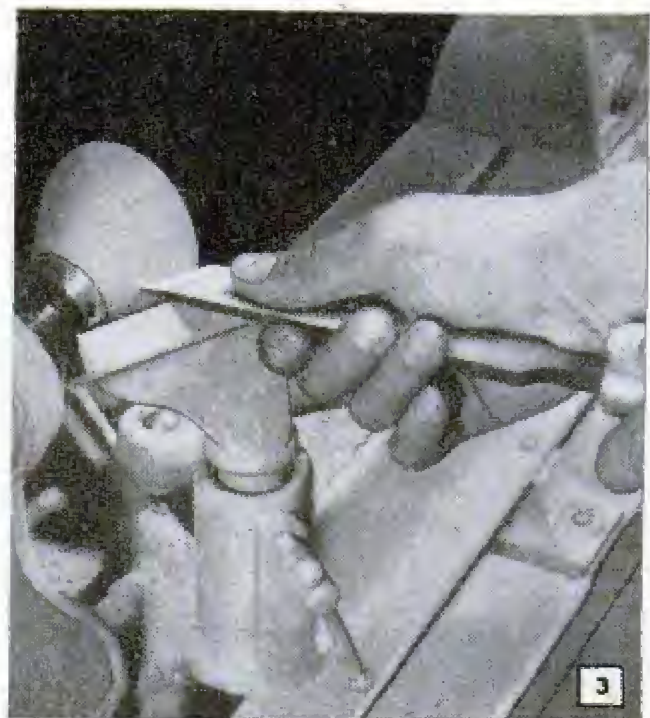
A FEW HOURS of fun with your wood-turning lathe can result in these attractive candlesticks, Fig. 1, that will please even the most discriminating person. While they are not a true climbing-spiral design, they do give that impression, and when made of contrasting woods, such as mahogany and maple or birch, they will add a decorative touch to any home.

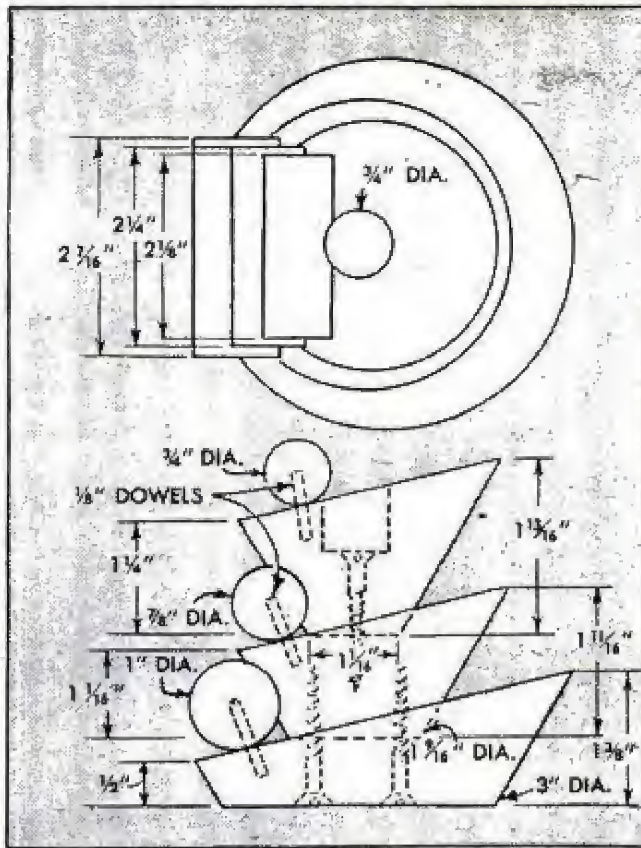
Mark and cut the cone sections for both candlesticks from a block of hardwood as shown in the detail, and sand the top face of each one. Locate the center on the bottom of each piece by drawing intersecting lines from the corners. Rough out the sections by removing waste from the corners with a chisel. Then mount one of the upper sections in the lathe on a screw center, Fig. 3. Set the tool rest at a 30-deg. angle and use it as a guide in turning the diameter. When this piece has been turned to size, bore the candle socket, Fig. 4, and sand the part to a smooth finish. Duplicate this procedure on the upper section of the other candlestick, and drill the tops of both sections to take $\frac{1}{8}$ -in. dowels which are used to attach a cylinder. Next, fashion each of the two middle sections of the candlesticks



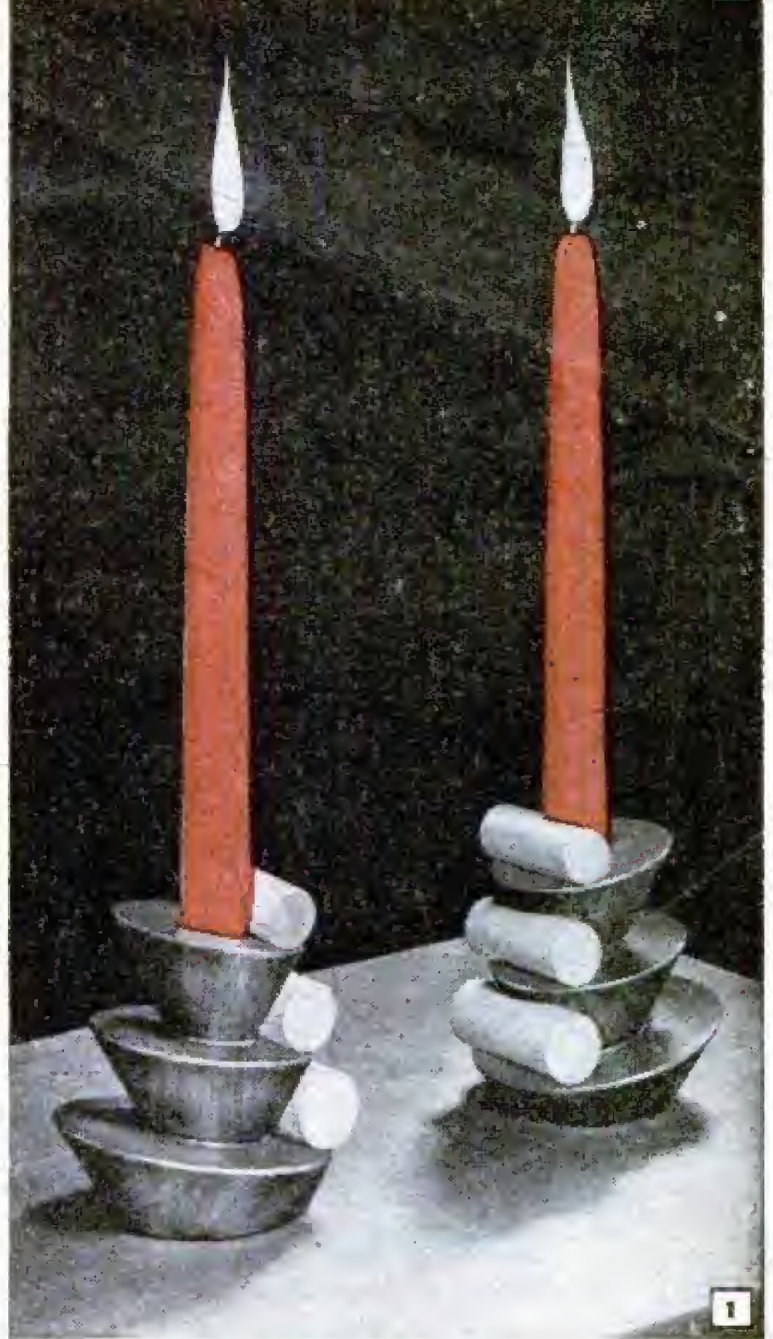
in the same manner, but counterbore the top to fit the bottom of the upper cone. Follow with the lower sections, which also are counterbored. Then, screw the cone sections together and stain them.

The dimensions of the decorative cylinders are given in the detail. Turn them as in Fig. 2, cut them apart and dress the ends on a sander. Then, scribe each cylinder as indicated to fit against the corresponding cone section, and shape with a half-round





file. Drill each one for attaching with dowels. Sand or scrape the cone sections at the points where the cylinders contact the sides of the cones in order to remove the stain and filler. Before gluing the cylinders in place, notch each top one at the point where it overhangs the candle socket, Fig. 5. When the glue sets, varnish or lacquer the candlesticks.



1

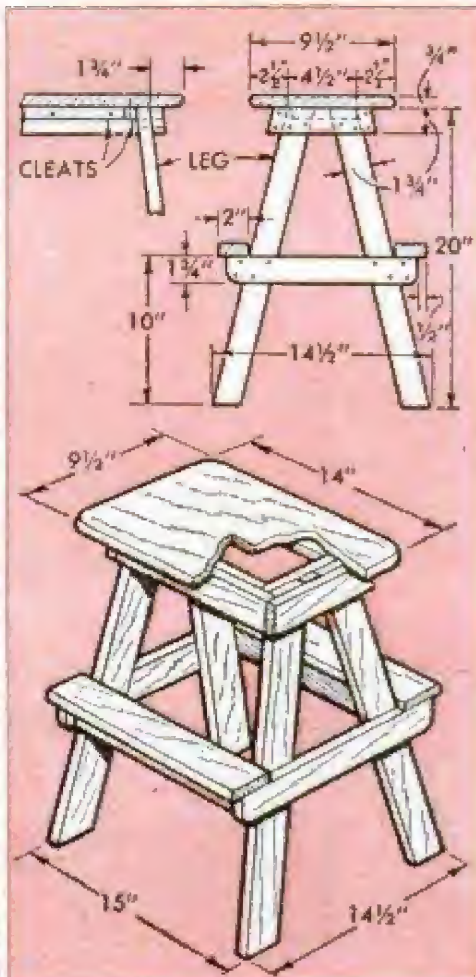


4



5

This Easy-to-Make Kitchen Step Stool Has Variety of Uses Around the Home



tion of this handy kitchen stool will be ample reward for the few hours devoted to making it. The stool is only 20 in. high—a convenient height for many purposes. It can serve as a kitchen work stool, a small stepladder for reaching shelves or cabinets, and a child's chair at mealtime. Make it of $\frac{3}{4}$ -in. hardwood and assemble the parts as shown in the detail. Glue all the joints and fasten them with $1\frac{1}{2}$ -in. wood screws. Note that cleats are attached to the inner faces of the apron pieces for screwing the top of the stool in place. Finish by sanding and apply an undercoater or sealer. When this dries, sand it lightly and follow with two coats of enamel that will harmonize with the color scheme of the kitchen.—Orville Wandersee, Springfield, Minn.

Tower-of-Benares Puzzle Fascinates Both Adults and Children

This puzzle has its origin in a strange East Indian legend, and will afford many hours of interesting and amusing competition. The problem is to move the stack of disks from the left-hand peg to the right-hand peg, one at a time, without covering a smaller disk with a larger one during the

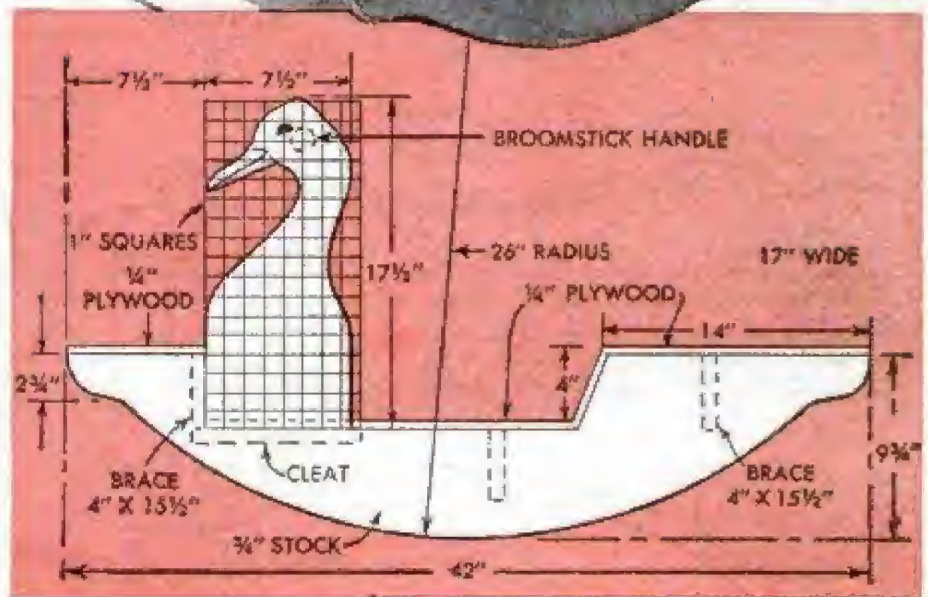
process. The disks and base are cut from scraps of wood, and the pegs from lengths of dowel. The disks should be numbered consecutively from 1 to 6, beginning with the smallest disk. Paint the odd-numbered disks one color and the even-numbered disks a contrasting color. After this, paint each of the pegs a different color, letter the left-hand peg A, the center peg B, and the right-hand peg C. The stack of disks can be transferred in 63 moves, and the solution to the puzzle is in the pattern of moves. The odd-numbered disks should be moved from left to right, and the even-numbered disks from right to left in rotation, except disk number 1 which is moved from left to right every other turn. The order of moves is: 1 to B, 2 to C, 1 to C, 3 to B, 1 to A, 2 to B, 1 to B, etc.



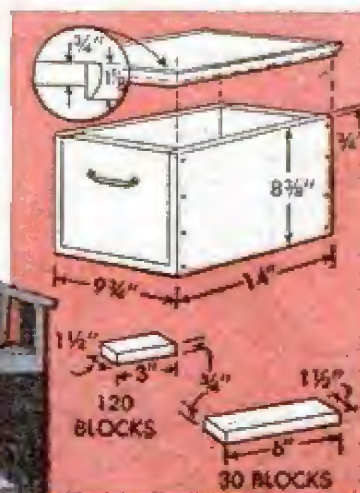
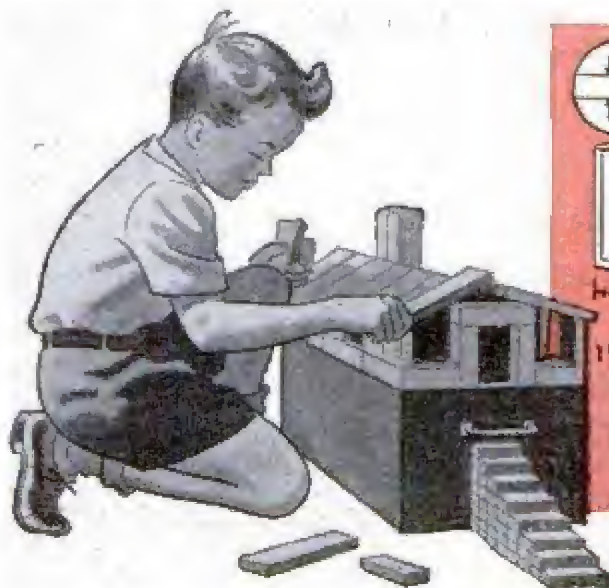
100 W. P.

Twin-Duck Shoofly Gives Youngsters Merry Ride

Children will have a circus with this rollicking toy and it will appeal to the man whose tools are little more than a hammer and saw, for it's very easy to make. The toy differs from the usual shoofly in that it is ridden in a sitting or standing position. Box lumber or wood salvaged from an old piece of furniture will do for most of it, although plywood is best to use for the duck heads so that they will not split off. Sawing the duck heads will require the most work. Draw a full-size pattern for these by ruling 1-in. squares on paper and transferring the outline to corresponding squares. The heads can be sawed one at a time with a coping saw, or you can have these parts of the toy bandsawed at a local pattern shop. The sides of the shoofly are laid out on a $\frac{3}{4}$ -in. board, 10 in. wide. The radius can be marked by holding a pencil at the end of a stick which has a nail point 26 in. from the end. The sidepieces are joined with three braces placed flush at the top and then covered with $\frac{1}{4}$ -in. plywood or solid stock. The duck heads are fastened to the inner face of the sides with



screws and a broomstick handle is added between the heads. Enamel the sides and duck heads white and the rest red or yellow.—D. Giaquinta, Canton, Ohio.



Block House Erected On Storage Box

Besides furnishing a place to store the blocks, the box for this set of building blocks also serves as a part of the toy and is used as a base on which a house or other structure is erected. In addition to the box, the set consists of 150 blocks, 30 being larger than the others. The box is fitted with handles and a slip-on lid.—E. S. Macgowan, Minneapolis, Minn.

SOLVING



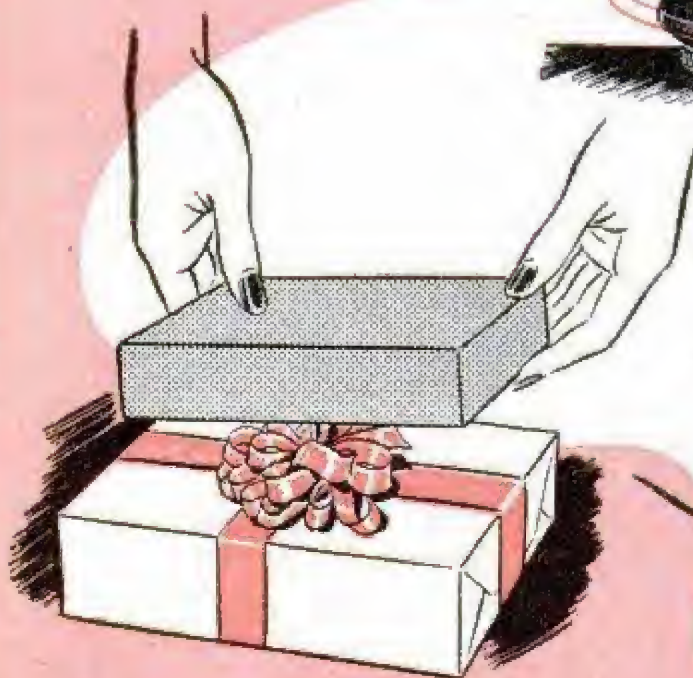
Dress patterns can be catalogued for ready reference when kept in a loose-leaf binder and labeled. Use original pattern envelopes and punch holes in them to fit the rings of the binder



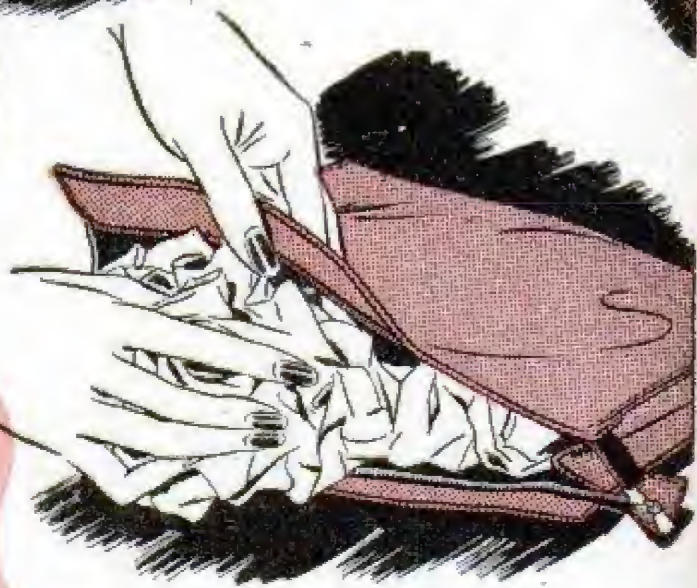
Rubber hose washer makes a good substitute for tie strap on an umbrella if original strap is missing



If thread unwinds too fast on a sewing machine, place a faucet bibb washer under the spool for more friction



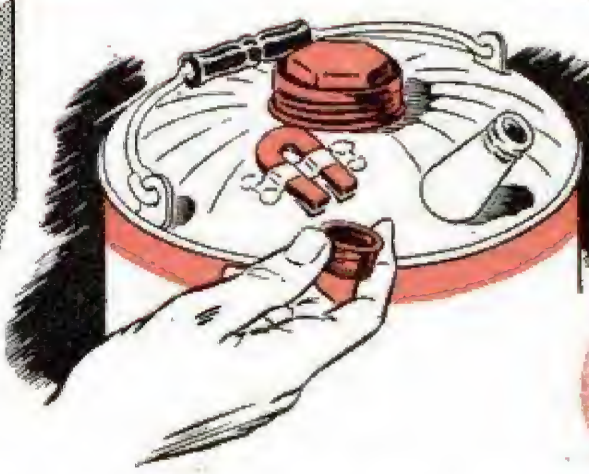
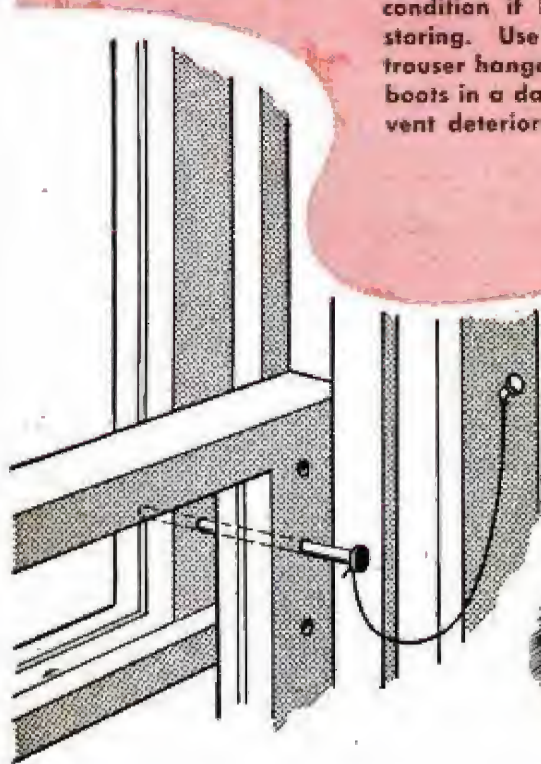
To protect a fancy bow on a gift package from being crushed when mailing, place the cover of a cardboard box over the bow before wrapping. Use a box top somewhat smaller than the gift package



Discarded lady's purse is put to good use by filling with crumpled newspapers and using it as a kneeling pad. Sponge rubber or old sweater, as filling, makes a softer, more permanent pad

HOME PROBLEMS

Hip boots are kept in good condition if hung up when storing. Use a clamp-type trouser hanger and store the boots in a dark place to prevent deterioration of rubber



Foolproof device to lock bedroom window in raised position consists of large nail which engages holes drilled in sash. Note that a blind hole is made in outside sash

Screw cap on spout of gasoline can is not misplaced if permanent magnet is provided to hold cap when removed. Before soldering metal strap which holds magnet, be sure to fill can completely with water

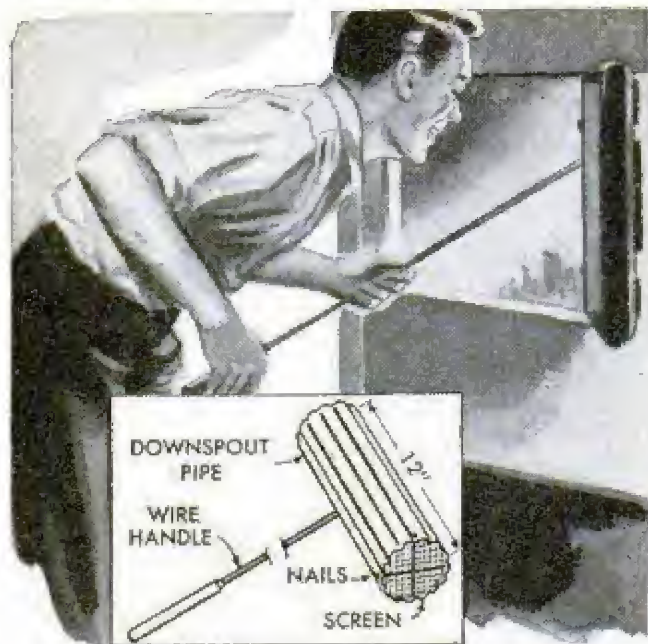


Pencil eraser in floor-brush socket will keep handle from loosening if threads are worn



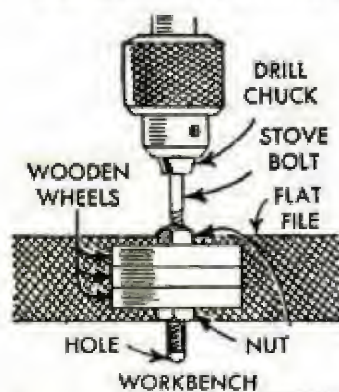
Porcelain insulators of the screw type provide excellent nonrusting hooks for clothesline. Screw them into studs when fastening to the house

"Fire Tube" Aids Starting Fire In Stove or Furnace



If your stove or furnace smokes due to a cold, damp chimney when a fire is started, you can prevent it by preheating the chimney with this "fire tube." By doing so, a draft is created in a short time which draws the smoke up the chimney. The fire tube is made from a 12-in. length of downspout pipe, one end being fitted with a grate of screen wire held by two nails fitted crosswise as shown. A length of stiff wire is attached for a handle. To use the fire tube, place a handful of kindling in the tube and ignite it through the bottom, hold the fire tube inside the stove or furnace and near the smoke pipe. Then when the fire in the tube burns briskly, dump the contents onto a bed of wood and coal previously made and the fire will take hold quickly. It is best to form a small hole or pocket in the kindling bed to keep the fire concentrated.

Wooden Wheels for Pull Toys "Turned" With Hand Drill

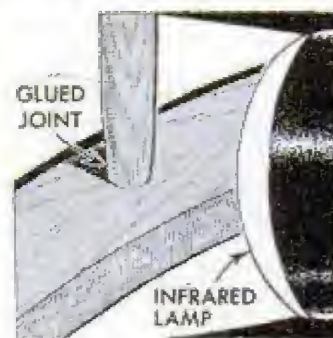


Not having a lathe to turn some wooden wheels for a pull toy, I used a hand drill to turn them. After sawing the disks as closely to line as I could, I drilled a hole through the center of each one and mounted the disks on a bolt, tightening them together with a nut on each side. With the bolt clamped in the chuck of the drill, and a hole drilled in the

workbench to serve as a bearing for the end of the bolt, I had another person hold a flat file against the edges of the disks while I rotated them with the drill. When the file was held on edge and pressed squarely, but lightly, against the work, it was possible to produce neat little wheels by hand.—Chester Wathey, Philipsburg, St. Martens, N. W. I.

Glued Furniture Joints Dry Quickly Under Infrared Lamp

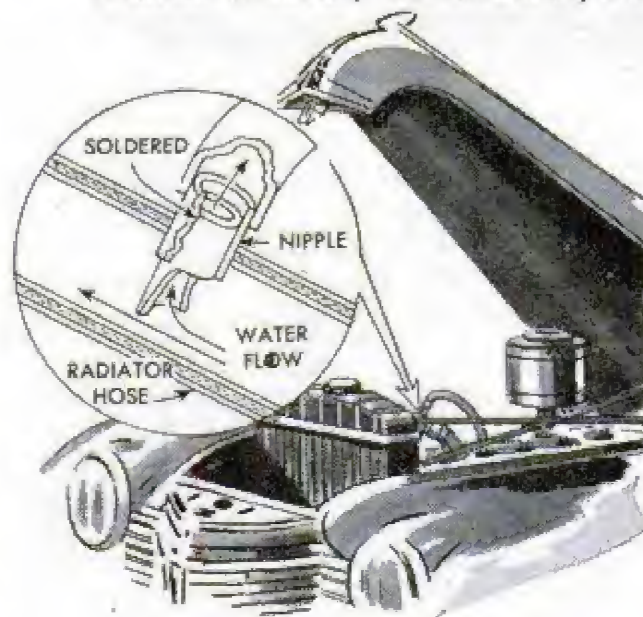
When time is a factor, the heat from an infrared heat lamp will hasten the drying of small glued joints, such as chair rungs or legs. This works best when using a resin-type glue, which sets quickly when heat is applied. Small furniture repair shops will find this hint helpful in doing "while-you-wait" and similar rush jobs.



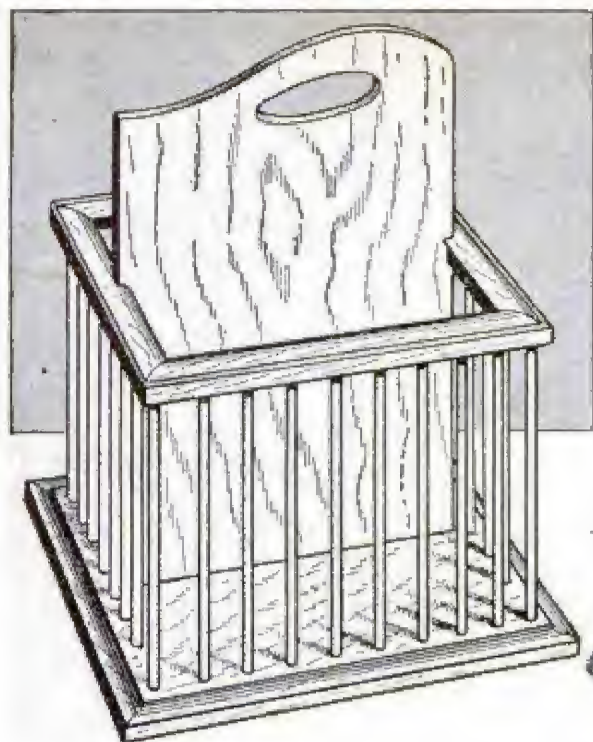
Baffle Directs Flow of Water To Increase Heater Output

Troubled by poor water circulation through the hot-water heater of his car, which had no thermostat in the cooling system, one motorist found that a baffle installed in the heater-hose nipple at the point where it enters the radiator hose helped deflect the water into the heating system and increased heat output as much as 50 percent. The baffle is a short piece of copper tubing, cut to the shape shown, and forced tightly into the hose nipple. Let it extend 1 in. and solder it to the nipple.

William Williams, Wilkes-Barre, Pa.

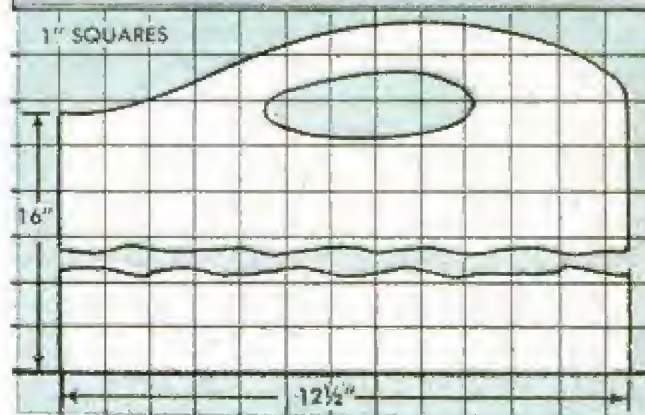
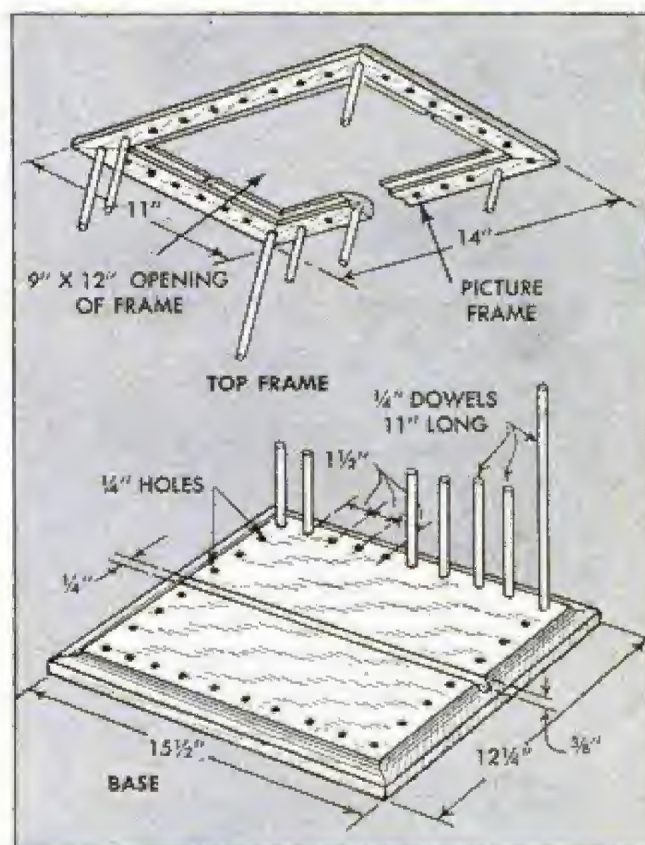


Novel Magazine Rack Is Made With Hand Tools

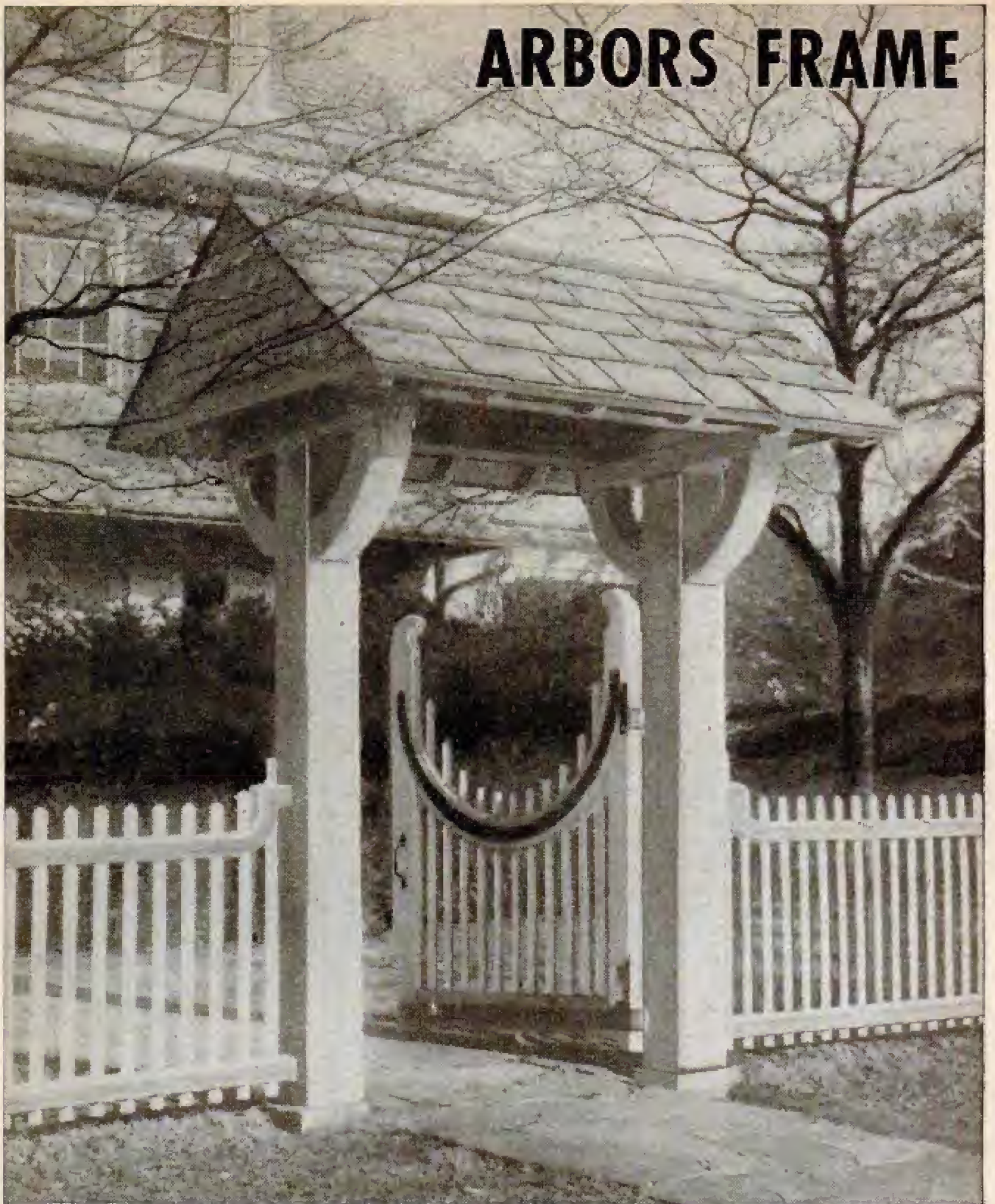


A BREADBOARD, a picture frame, a piece of $\frac{1}{2}$ -in. plywood, and a number of $\frac{1}{4}$ -in. dowels are the principal parts of this unusual magazine rack. The design fits in nicely with the furnishings of a den or basement recreation room. Although a breadboard or kneading board from an old kitchen cabinet makes a good base, you can build up a base by gluing together several wooden strips to make the required width. The base is detailed with molded edges but if no shaper is available it can be simplified by merely rounding the edges evenly. Holes for the $\frac{1}{4}$ -in. dowels are spaced and drilled to a uniform depth in the base as indicated. Groove the base as shown. Top frame of the rack is a hardwood picture frame of the dimensions given. Holes are drilled in the back of this frame to register with those already drilled in the base. Cut all the dowels to an equal length and insert in the holes in the picture frame. A spot of glue on the end of each dowel will hold it in place. Next, place a drop of glue in each hole in the base. Then invert the picture frame over the base and insert the dowels one by one into the holes. Finally, tap the top of the frame lightly with a mallet to seat the dowels in the holes. Cut the center panel to the shape and dimensions given in the squared pattern, sand the top edge and the edges of the hand-hole smooth, notch the top frame as indicated and glue the part in place. Finish in the natural color with shellac and varnish or clear lacquer, or with colored enamels to match other furniture.

Simon S. Palestrant, Bronx, N. Y.



ARBORS FRAME



ARBOR-FRAMED GATES and pergolas such as these, will enhance the beauty of the grounds around your home. Regardless of the size of your property, they will add interest to an otherwise plain entrance and afford the opportunity to grow climbing vines and other plants that would be impossible to train without them. These photos show several of an unlimited number of designs that can be built by anyone with a few hand tools, and you can make them just as simple or as pretentious as you wish from standard stock.

The unusual gable-roofed pergola shown above is covered with slate shingles to provide a shelter and has massive pillars that achieve an imposing appearance. The large arbor pictured on the opposite page has seats on either side and a heavy lattice-work roof which adds a note of dignity to more spacious grounds. Two buggy wheels painted white and securely mounted on each side of a driveway add a novel touch to a white picket gate between them. The carriage lamps hung from lengths of pipe are in keeping with the theme of the ar-

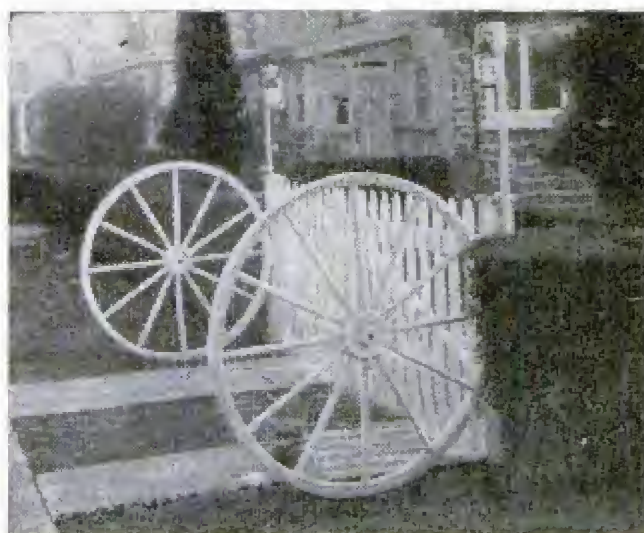
ENTRANCE GATES



range. A buggy wheel set halfway into the ground, makes a clever trellis that also provides an attractive support for the numerals of the house number.

The conventional arched trellis, over which a privet hedge has been trained to grow, is a unique gateway. However, it will take several years for a hedge to attain the symmetry of the one in the photo. Another type of arbor shown is one made from strips of regular lattice stock, some of which have been bent U-shape and attached to short posts to form a framework for strips applied horizontally. When vines or climbing roses cover it, this ornamental arbor will shade the walk. In most cases, the strips can be bowed dry, but if the curve is of small radius, the strips can be made more pliable by soaking them in water for several hours and bending them while they are wet.

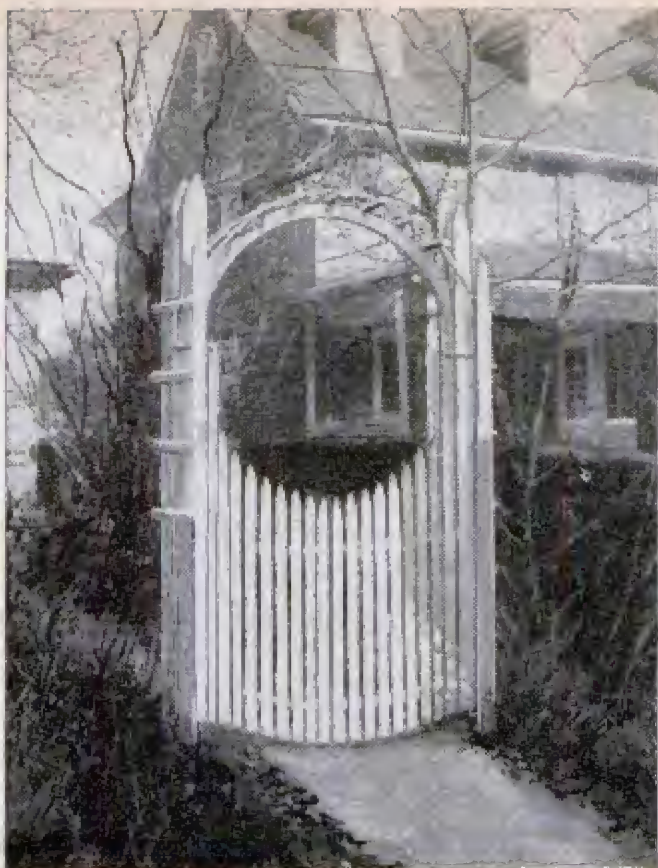
Since these arbors and pergolas are of a semipermanent nature, use the best weather-resistant wood available for their construction. Redwood, western red cedar and cypress are especially suited to this purpose. These woods are durable, take paint well and are easy to work. If they are not available, white pine or other regular lumberyard stock will do, provided it is kept well painted. Ample protection over a period of years can be had





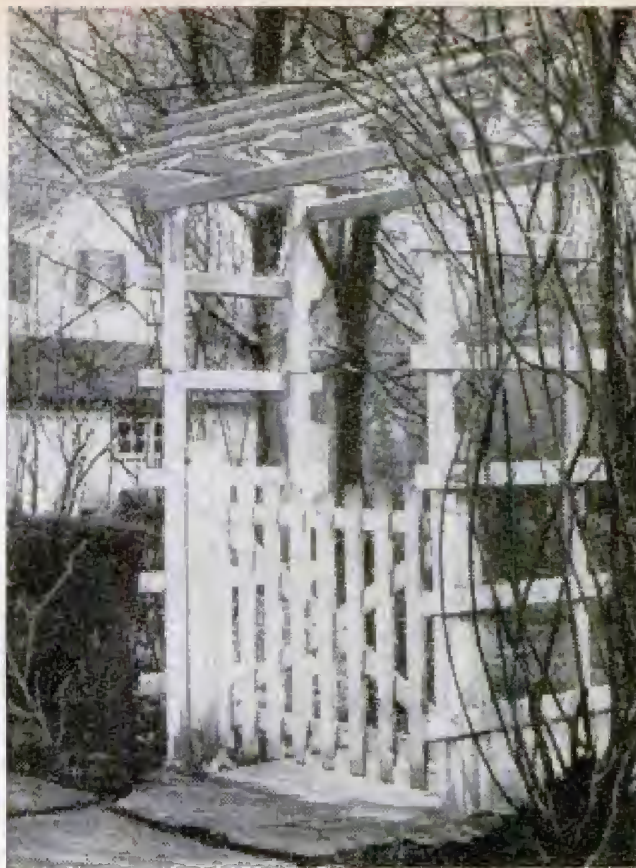
by applying three coats of any good outside paint or two coats of creosote stain. Paint all parts with a priming coat before they are assembled. Before nailing the pieces together, coat all of the adjoining surfaces with white-lead paste to prevent dry rot.

Set the supporting posts at least 24 in. into the ground. The portion of the post that will be below ground should be tarred or creosoted. To do this, soak the posts in creosote for several hours, and have the solution in a can deep enough so that the coated portion of the posts will reach 5 or 6 in. above the ground after they are in place. It is advisable to set all the posts, especially large ones, in concrete. Dig a hole several inches wider than the post and about 4 in. deeper than the distance the post is to be set below the ground. After the posts are set in the holes, plumb them and tamp the concrete well around them. When the concrete has cured, sometimes a small opening around the post will appear due to shrinkage. It is likely that water will seep into these openings, so seal them with oakum or roofing cement. One way to anchor a post securely in concrete is to drill a hole through it near the lower end, and insert a piece of broomstick or metal rod crosswise so that it projects 3 or 4 in. on each side. This will key the post securely.



Trellis, with semicircular roof, and picket gate form interesting oval frame. Note how the tops of the supporting posts are pointed. Short strips of lattice stock are fastened horizontally to the posts and arch

Pleasing arched entrance through the high, thick hedge is effected by this trellis along with a gate of unusual design. Use of vertical slats on arches and sides presents a distinctive, unique appearance

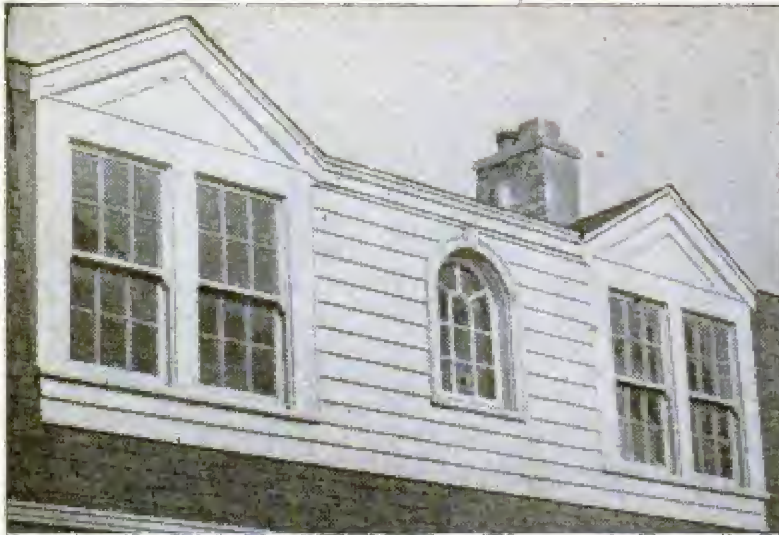


Sturdily constructed pergola with gable-type lattice roof makes a gateway that blends well with the wooded surroundings. Set in concrete and kept properly painted, it will remain an attraction for years

Ornamental arbor sets off entrance way in neat picket fence. Scrollwork near top of supporting pillars lends delicate touch, and horizontal lattice on posts provides trellis for vines or climbing roses



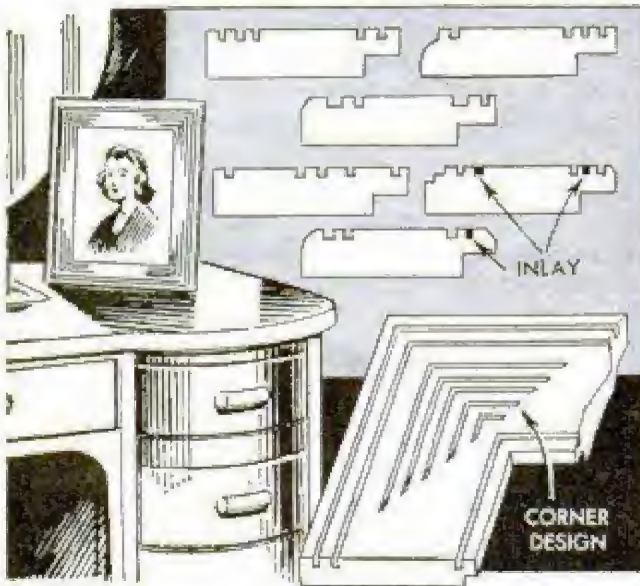
Twin Gables Give Lift to the Shed-Type Dormer



To improve the appearance of shed-type dormers on a Dutch Colonial home, one contractor added gable roofs over the windows at each end and obtained the pleasing modified Cape Cod appearance shown in the photo. The installation of a small arched window relieved the plainness of line and provided a finishing touch to the whole dormer. Flower boxes with scrollsawed fronts also will contribute a decorative touch. Adding such gables can be done to any existing shed dormer without the necessity of doing a major remodeling job.

Attractive Picture-Frame Molding Produced With a Circular Saw

Requiring only a circular saw, these varied designs for picture-frame molding show what can be done with this versatile workshop machine. After sawing the conventional rabbet for the glass, picture and

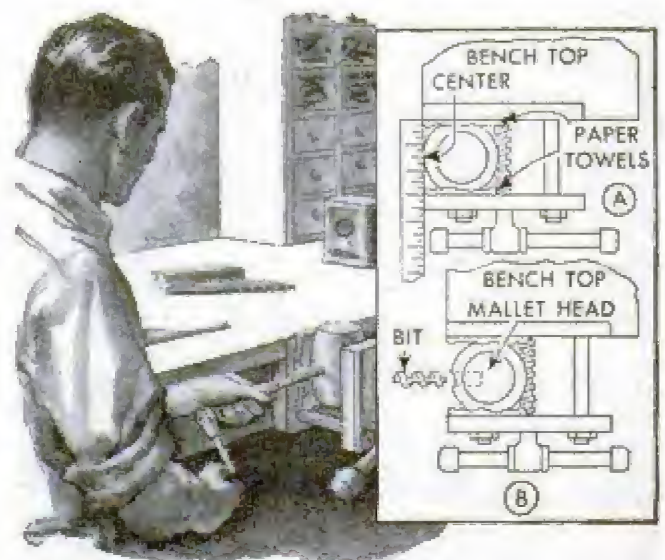


cardboard backing, the face of the stock is grooved lengthwise to form a border design around the edge of the frame when assembled. This is done with the saw blade projecting about $\frac{1}{8}$ in. Some of the grooves can be inlaid with regular inlay banding, or with strips of contrasting wood. Decorative grooves also can be cut at the corners of the frame. To do this, first miter the four pieces of the frame. Then, clamp a stop block to the saw fence to equal the length of cut, set the fence and make the first groove. You'll be able to make this initial cut at one end of each piece with this one setup. Each subsequent cut is made by resetting the fence and the stop block. When the required number of cuts are made at one end of each piece, the pieces are turned end for end and similar cuts made so that they align with the others when the frame is assembled. A drill press with router attachment also can be used to cut the grooves.

Drilling Mallet Head Accurately

Drilling a hole squarely by hand in a gavel or mallet when fitting it with a handle is done with little trouble in the following way: Clamp the turning vertically in a bench vise so that one side is flush with the sides of the jaws. Then, holding a rule in contact with the turning and the jaws as in detail A, measure one half the distance between the jaws and make a mark on the turning. Without changing the position of the turning in the vise, mark the half-way point lengthwise. The point where the two marks intersect is the drilling point. Guide the bit at right angles to the axis of the turning by sighting along the vise jaws.

C. R. Schlegel, Jenkintown, Pa.





CUTTING TAPERED LEGS

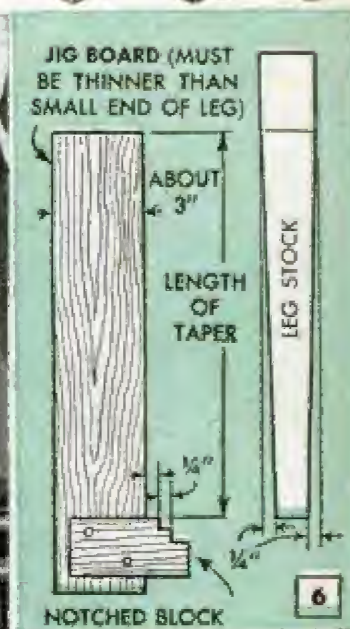
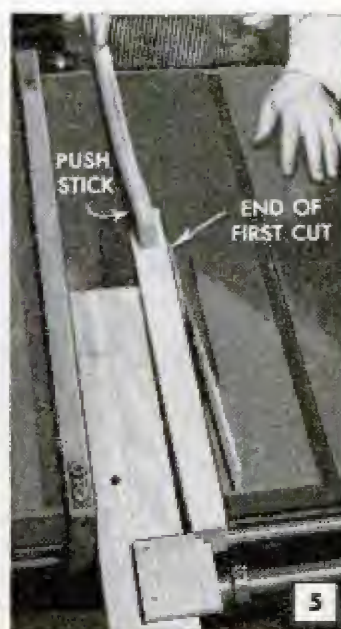
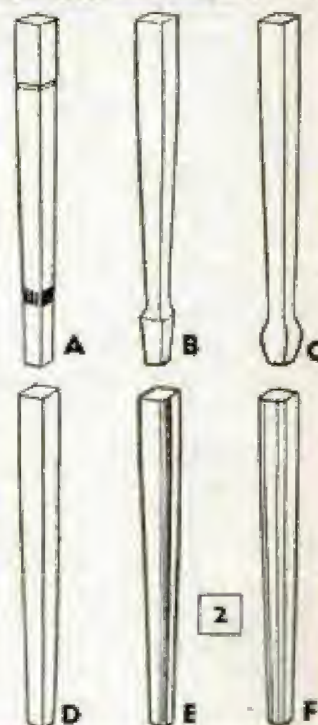
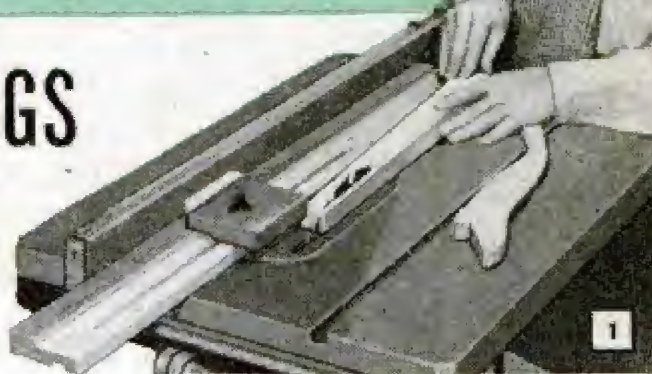
Simple wooden jigs to guide the work make it easy to duplicate tapered legs in quantity with saw, jointer or shaper. Includes straight and spade-foot types

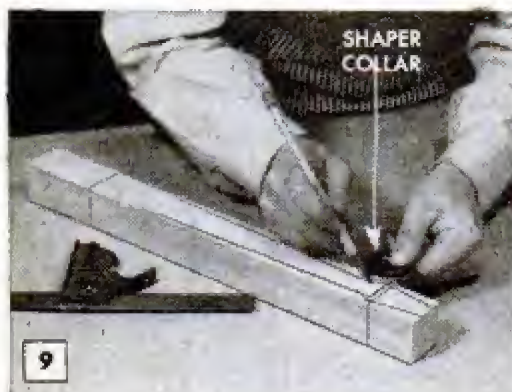
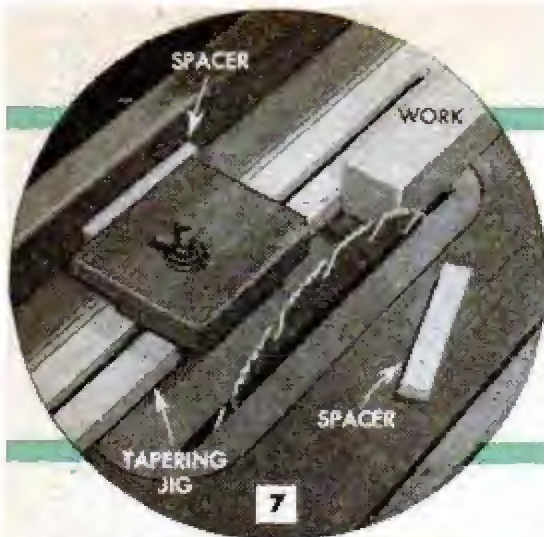
By Sam Brown

CHARACTERISTIC of the Adam and Hepplewhite influence in period-furniture design, the square tapered leg in any of its variations lends itself to mass-production in the home shop by using a few simple jigs. Power tools are required, but the straight-taper leg can be cut completely on just a circular saw. A shaper or jointer is needed to produce the popular spade-foot leg.

Design variations: Various leg styles are pictured in Fig. 2. Style A is a straight taper with a decorative groove at the top and an inlaid or painted band near the bottom. B shows the spade foot commonly used for period pieces, and C is somewhat similar but with the spade rolled into the taper without a break of line. Leg style D is a straight taper on two sides only, a style often used because it represents less work and the slight splayed effect is quite attractive. E is a straight taper with outside corner rounded, very popular for modern furniture, and F shows another edge treatment, with all edges beveled. In period pieces, the legs often are ornately carved, fluted or inlaid on the show faces, but for modern pieces the only decoration in popular use is the banded style pictured at A.

Cutting the straight taper: Whenever practical, the taper should be sawed in preference to jointer and shaper methods. The best





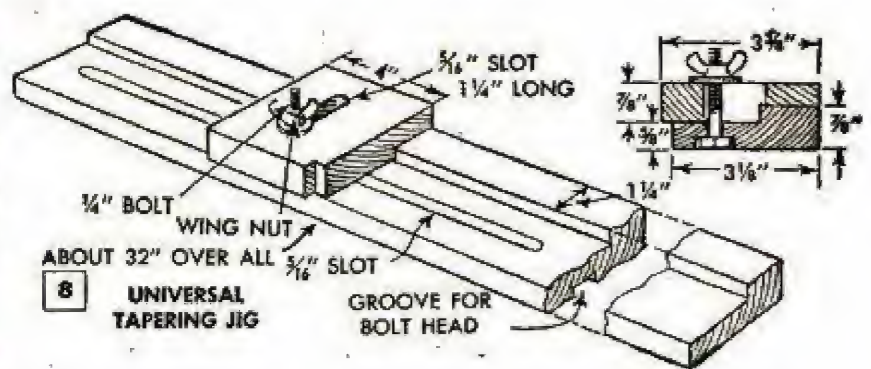
Draw outline of leg in pencil on adjacent faces and use shaper collar to mark curve



To save wear on the cutting edges of the shaper knife, remove waste wood first



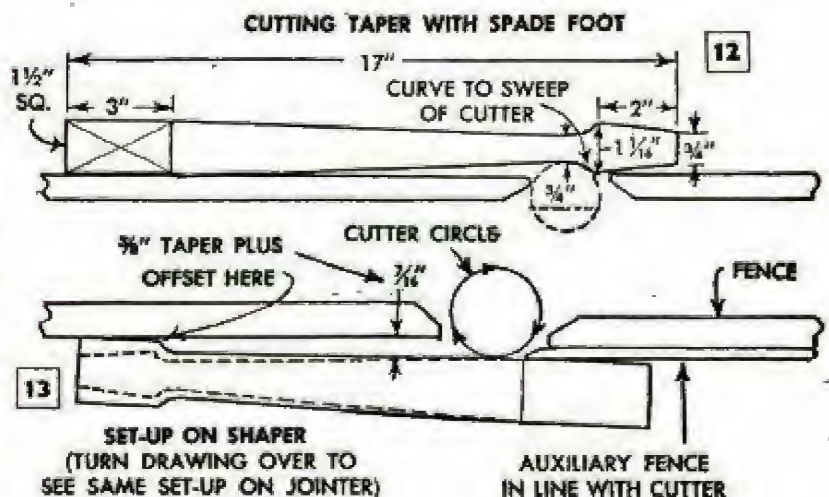
Either a jointer or shaper can be used to cut the taper. Infeed table or fence, as the case may be, is offset a distance equal to the amount of taper you desire

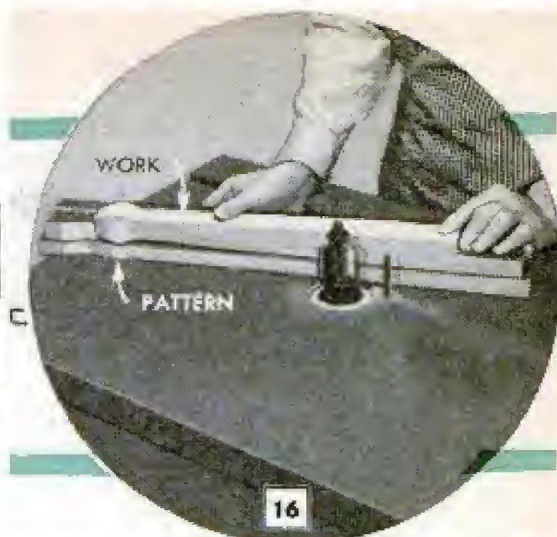
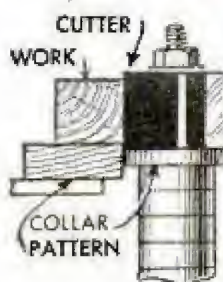
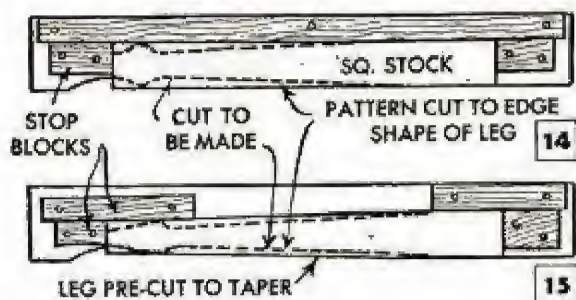


blade to use for this is a combination one, hollow ground, sometimes called a planer saw. Such a blade produces an exceptionally smooth cut, requiring only light sanding. Fig. 6 shows a typical straight-taper leg design, calling for a $\frac{1}{4}$ -in. taper on each face on all four sides. Fig. 6 also shows a simple jig which is used in conjunction with a circular saw. The jig board should be as long as the tapered part of the leg, plus 3 or 4 in. to accommodate the notched block. Notice that the depth of the notches in the block must equal the taper, in this case, $\frac{1}{4}$ in.

How the jig is used: With work dressed to net size and perfectly square, the saw-fence setting is made to equal the combined width of jig board and work, as shown in Fig. 3. Then the work is placed in the first notch of the jig and pushed into the saw, Fig. 4. Note that feed pressure is on the work, not the jig. The end of the cut is shown in Fig. 5. Two adjacent sides are cut with the work in the first notch. Then, without disturbing the fence setting, the two remaining sides are cut with the work in the second notch. To compensate for the waste removed from two sides, retack a block equal to the thickness of the waste so that the work will ride horizontally in cutting each taper. A push stick must be used for feeding near the end of the cut, Fig. 5.

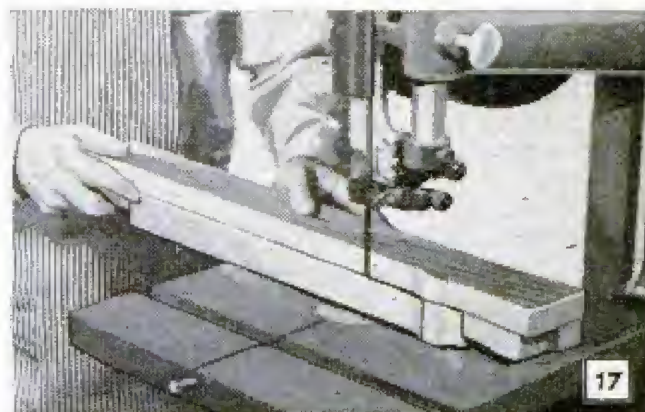
Universal jig: While the jig board is practical, some workers prefer a more permanent device, such as the one shown in Fig. 8. Here, only one notch is used, the sliding block being arranged so that it can be adjusted to any taper up to $\frac{1}{2}$ in. (about $1\frac{1}{8}$ -in. taper if the cut is made on one side only). This jig is set with spacing blocks placed between the jig and



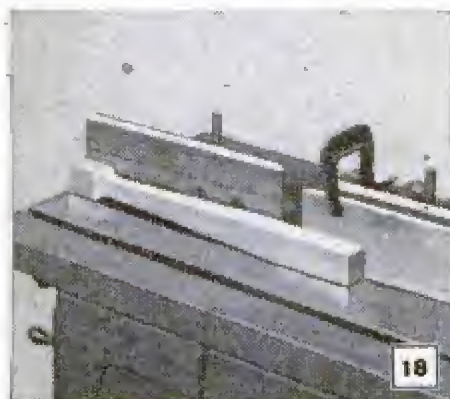


saw fence. In the example shown in Fig. 6, the spacer blocks would be $\frac{1}{4}$ in. thick. The saw-fence setting is made as before. Offsetting the block for the first cuts is made with one spacer block, as shown in Fig. 7. The final cuts are set with two spacer blocks as in Fig. 1.

The spade foot: It is not possible to make the long taper of this style of leg on a circular saw, hence the cut must be made by a jointer or shaper. Start by laying out the shape of the leg for a master pattern, Fig. 12, and make the curve at the bottom equal the radius of the shaper collar or jointer cutterhead, Fig. 9. Rough-bandsaw some of the surplus wood on all four sides, but leave the spade portion at full thickness, Fig. 10. Next, set up the shaper or jointer for tapering. This setup requires that the infeed table or fence must be offset from the cutter a distance equal to the taper desired, in this case, $\frac{3}{8}$ in., Fig. 11. Also, because the shape of the leg holds the work out from the fence, as shown in Fig. 13, this extra distance must be added to the offset. The out-feed end of the shaper fence is fitted with an auxiliary fence and this should be pushed up as close to the cutterhead as possible in order to minimize the slight bite at the beginning of the cut. The out-feed fence of the shaper or the jointer table must be exactly in line with the cutting circle of the knives. Fig. 18



shows the start of the cut and Fig. 19 shows the cut near completion. All four sides are run with the same setup. The short taper comprising the foot is sawed with a modification of the step-block idea. The taper required is $\frac{3}{8}$ in. on each side, hence the step-block has $\frac{3}{8}$ -in. steps. The proper position of the work in relation to the saw for the first cut is obtained by using a straightedge across the saw blade, aligning the pencil mark on the leg with the straightedge. Then the step block is nailed to the jig board at this setting. The first pair of adjacent sides is cut as before with the work in the first notch; the remaining pair requires that the work nest in the second notch, Fig. 20, to cut the taper.



Auxiliary fence minimizes slight "bite" of cutter at start of cut



Here taper cut is nearing completion. Note use of handscrew as a stop block



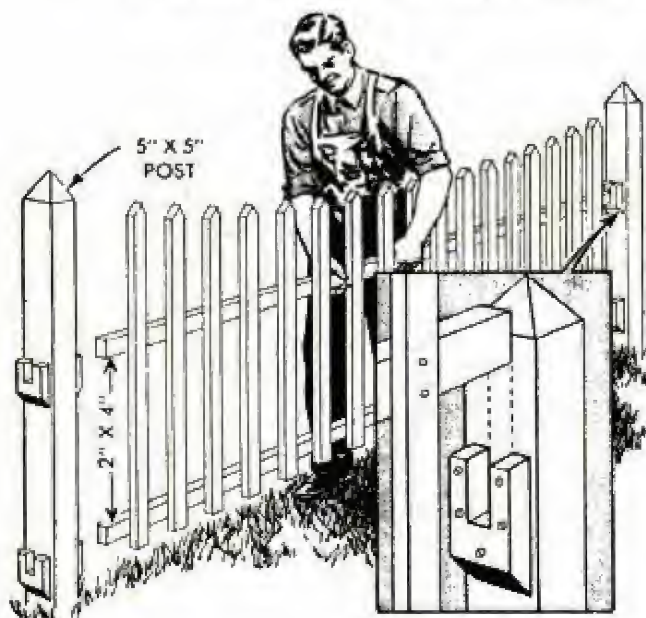
Taper of foot is cut on saw, using a modification of stepped block

Tapering with pattern: The rolled spade foot requires the use of a pattern, which should be cut to the outline of the leg, Fig. 14. The machine setup for this is conventional outline planing, the pattern riding a collar of the same diameter as the cutter, as shown in the end view and Fig. 16. If the cut is heavy, waste wood should be bandsawed by turning the pattern over with the work in place, Fig. 17. In fitting the work to the pattern with stop blocks, it should be noted that the thick portion of the leg at the spade foot must be exactly in line with the pattern. In other words, no stock is removed at this point. It can be seen that this is the contact point for final cuts and if wood is removed at this point on the first cut, the work will set deeper in the jig when the opposite side is cut. Note in Fig. 15, that when the spade is narrower than maximum, precutting of the leg to a straight taper simplifies the setup.

Sectional Fence Can Be Dismantled To Facilitate Mowing

Here's a picket fence designed to overcome the tiresome job of trimming grass along the bottom of a fence. It's assembled in sections so that you can lift each one out and mow between the posts. While this still requires trimming around the posts by hand, it does save considerable time, and by being removable, the sections of the fence also are much easier to paint. The pickets in each section, which can be arranged in any pattern desired, are nailed to the face side of 2 by 4-in. rails, cut to fit between the posts. The ends of the rails rest in notched blocks which are screwed to opposite faces of each post. The notch should be made a little oversize to allow for possible swelling and ample clearance when the parts are heavily painted.

David B. Clapp, Livingston, N. J.



Motorcycle Wheel With Lugs Makes Simple Plant Spacer



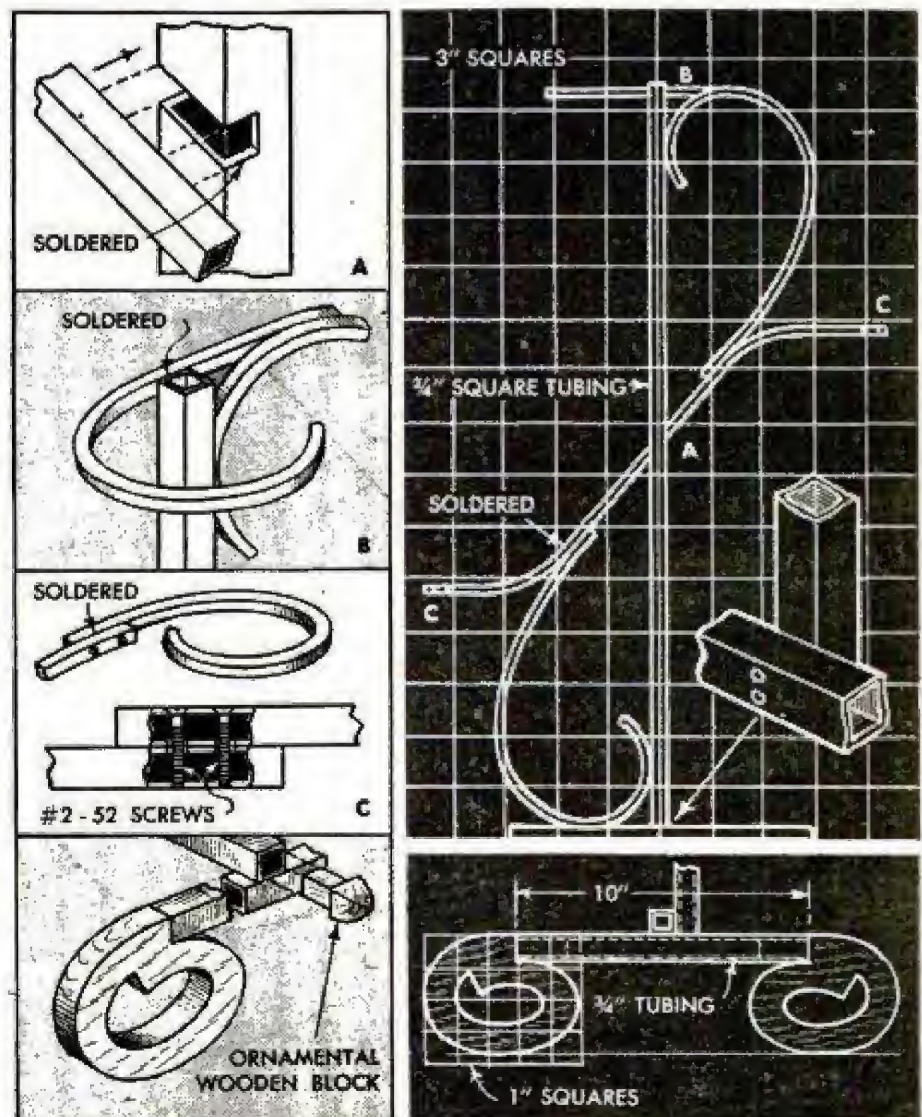
Home and truck gardeners alike will find this simple plant spacer a real time-saver and convenience. It is used like a wheelbarrow and has wooden blocks attached to the rim of a wheel which forms a continuous row of depressions, equally spaced, as the spacer is pushed along. A discarded motorcycle wheel was used to build the original, but any wheel of sufficient weight will do. Bolt or wire the blocks to the wheel, spacing them to equal the distance desired between the transplants, and fit the wheel with two wooden handles as shown.

Putty Colored Before Applying Eliminates Painting

When reglazing a window sash and time is a factor, you can save yourself the job of painting the putty later by coloring it before applying. If the window trim is white, simply add a little white lead or paint and knead it into the putty until the mixture is uniform in color and of a workable consistency. If too much paint is added and the putty becomes sticky, dust it with a little whiting and work into the putty with the hands. Colors in oil are good for matching purposes.

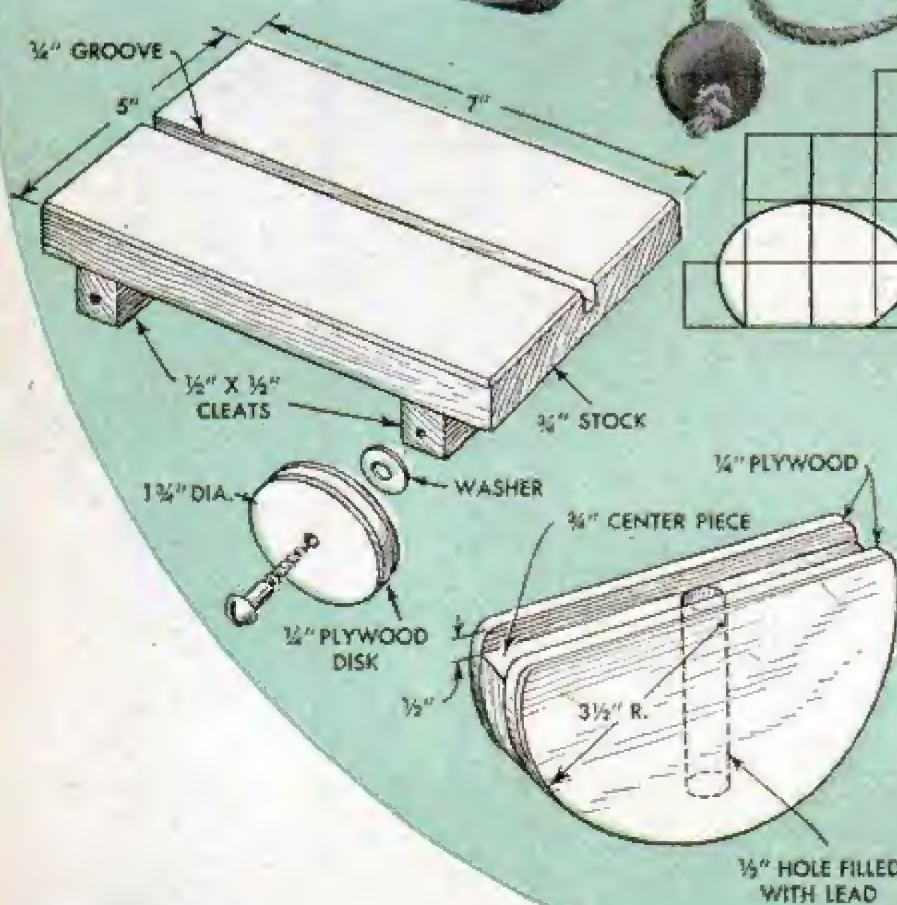
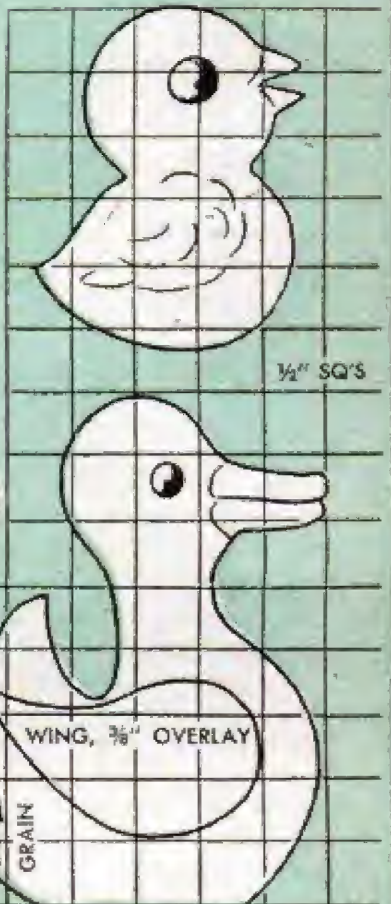


A GRACEFUL plant stand that gives the effect of fine ornamental ironwork, can be made from square brass tubing. Use $\frac{3}{4}$ -in. tubing for the base and standard, and $\frac{1}{4}$ or $\frac{3}{8}$ -in. tubing for the remaining parts. One way to form the tubing is to bend it around a wooden disk fastened to a bench top. Another way to bend the curved parts is to clamp an adjustable end wrench in a vise so that the jaws open in a vertical position. Then slide the tubing through the jaws, making a gradual bend. Always use a gentle, steady pressure. First, draw a full-size pattern as given in the squared drawing, and place the work on it occasionally to check the bending as you go along. After the parts are bent, assemble the stand as shown. If you prefer, the pot holders, C, and their supporting member, A, could be bent from a single length of tubing. Fasten all joints with small machine screws and high-strength alloy solder, and then file them smooth. The feet are jigsawed from pieces of hardwood and the tenon on each is cut to fit tightly into the tubing. Make a decorative wooden plug to fill the opening in each end of the base cross member. After the stand is assembled, enamel it white, or polish the brass with steel wool, apply a coat of clear lacquer, and stain and finish the wooden parts.—Alexander Maxwell, Evanston, Ill.



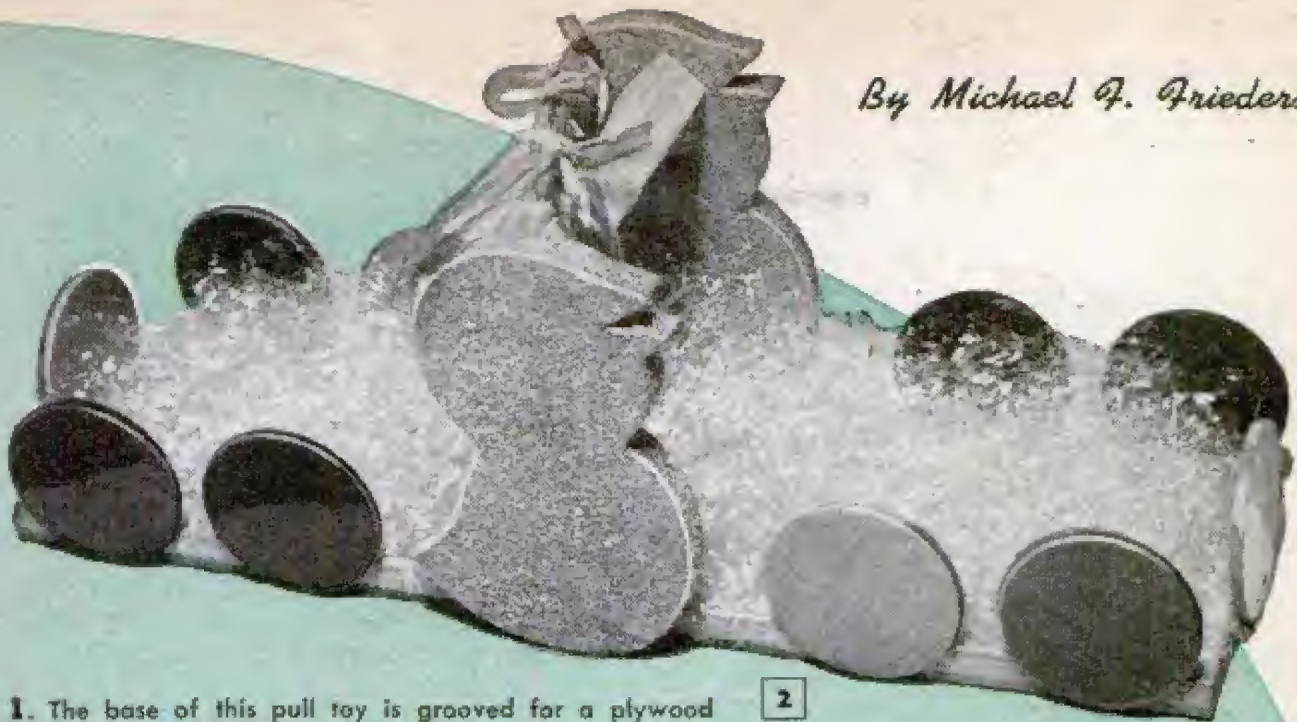
Easter Novelties

1



7





1. The base of this pull toy is grooved for a plywood duck which is flanked by six wooden eggs. The duck is given a novel finish by coating with glue and sprinkling with dyed sawdust. The wings are done a different color

2. This novel egg basket is made by nailing ten $\frac{1}{8}$ by $1\frac{1}{4}$ -in. disks of varied colors to edge of a $\frac{3}{8}$ by 4 by 12-in. bottom. Two chicks, with crosspiece between, form handle

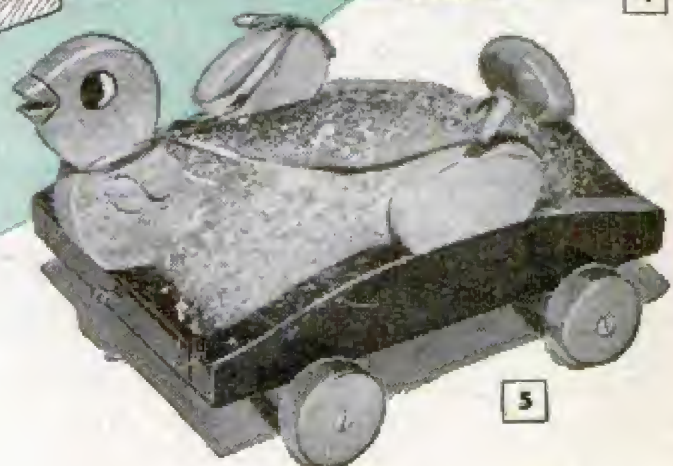
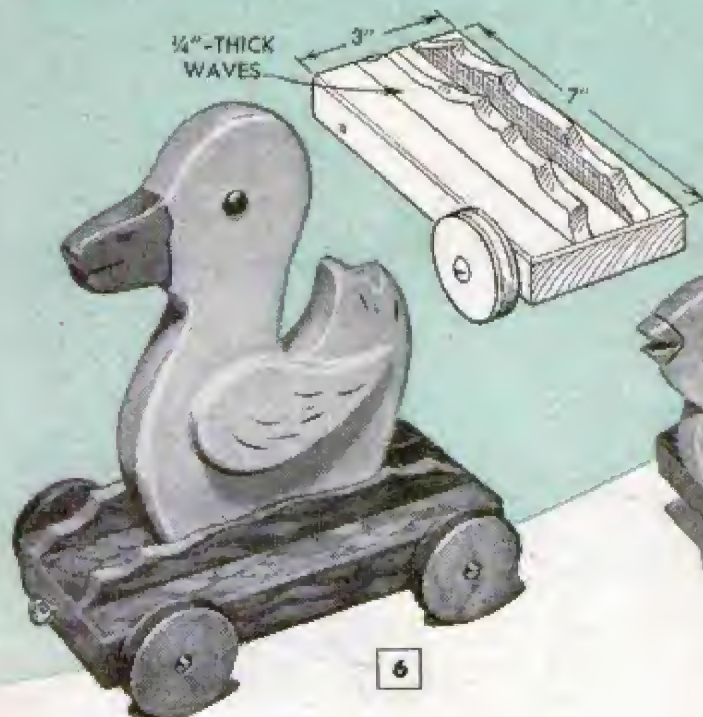
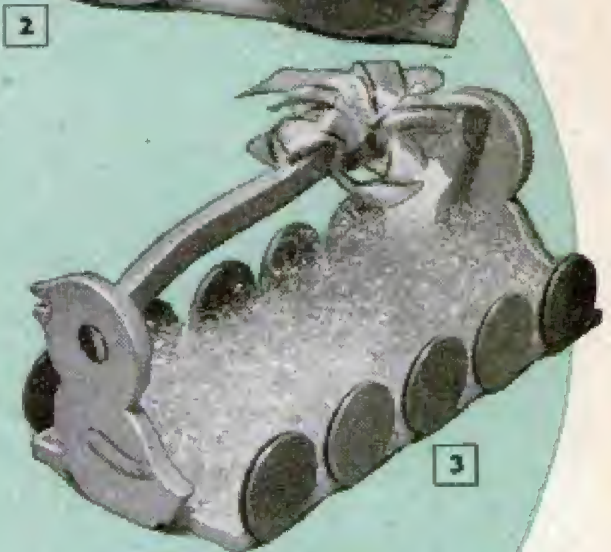
3. Differing from the basket above, this one has a 5 by 10-in. bottom and a curved handle between chicks at ends

4. This basket is a $\frac{1}{2}$ by 12-in. disk with twelve eggs around the edge and a $\frac{3}{4}$ -in. chick in center for a handle

5. Except for the bottom, which is $\frac{1}{8}$ by 8 by 10 in., all parts of the egg wagon are cut from $\frac{3}{4}$ -in. wood. Wheels are attached the same as in Fig. 1. Paint red and yellow

6. Wheels of this pull toy are screwed to edges of $\frac{3}{4}$ -in. base. A $\frac{3}{4}$ -in. duck is set between wooden waves and fastened with screws. Add whitecaps to blue enameled base

7. A piece of 2 by 4 grooved along the top can be used for the base of the roly-poly duck, or it can be built up as shown. Molten lead is poured in a hole in the center to counterweight it. Fasten duck in groove with small brads

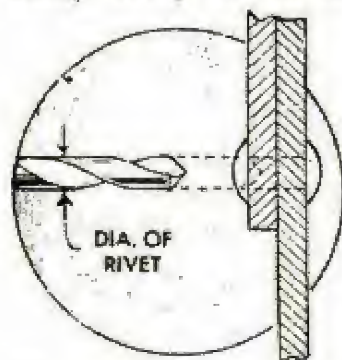


Blowtorch Fitted With Pipe Elbow Solves Outdoor-Cooking Problems



When on a hunting or fishing trip, building a campfire is often impractical or impossible. To save both time and trouble, a 90-deg. elbow attached to the nozzle of a blowtorch converts it to an effective cooking implement. This can be done either by threading the inside of the nozzle for a close nipple and attaching an elbow, or by placing a large elbow over the outside of the nozzle. With the elbow turned vertically to direct the flame upward, the blowtorch can be used by itself for heating coffee as shown, or placed below an improvised grate.

Easy Way to Remove Rivets



Instead of using a cold chisel or cutting torch to remove soft-iron rivets, try this stunt employed by a truck-body repair shop: First, center-punch the rivet head and drill a hole through the center of the head, using a twist drill of the same size as the body of the rivet. Drill through just the thickness of the head. Then place a punch in the hole and strike it sharply with a hammer. The blow will break the head free from the body of the

rivet and drive the remaining portion from the work. This method will not mar the surface of the work, and can be used to remove any iron rivet regardless of size.

John Krill, North Lima, Ohio.

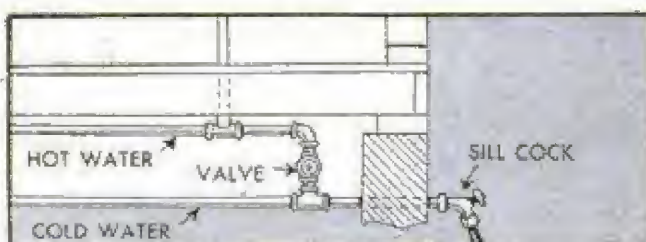
Spring Makes Pliers Self-Opening

If a pair of pliers is used frequently in bench assembly work, they can be made self-opening for rapid use by fitting them with a piece of spring steel, such as a clock spring. Just fasten the ends of the spring to the handles of the pliers by wrapping them with several turns of adhesive tape as indicated.



Valve Converts Sill Cock Into Mixing Faucet

Keeping porch floors and steps clear during winter is less work when you are able to use a hose and warm water. This is made possible by converting the outside sill cock into a mixing faucet so that you can temper the water to suit. All that is required is a shutoff valve installed between the cold and hot-water pipes as shown in the drawing. This does not affect the regular use of the sill cock during summer months as the valve makes it possible to shut off the hot water.



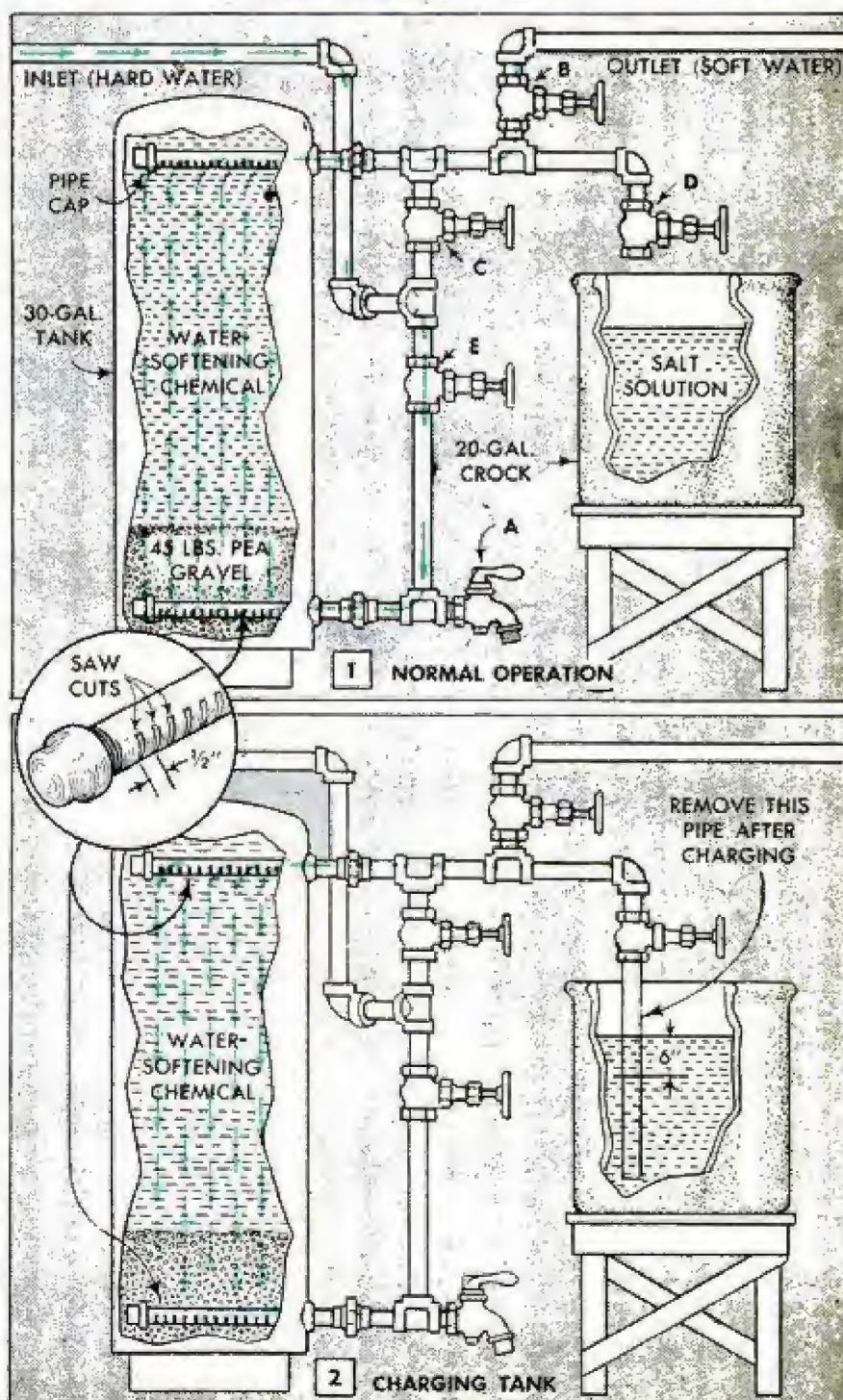
WATER SOFTENER

It's made from a 30-gal. hot-water tank, $\frac{3}{4}$ -in. pipe and fittings, and a large-size earthenware container

By A. E. Holden

HOME-DESIGNED and home-built by Maurice Arendt of Branch County, Mich., this water softener is of ample capacity to supply soft water for all purposes in the average home, with a minimum of servicing. It is periodically charged with a salt brine siphoned from a large earthenware container located near the softener. Fig. 1 shows the unit assembled with the valves set for normal operation. The arrows indicate the flow of water from the hard-water inlet through the softener and into the soft-water outlet, which may be connected to a hot-water tank or water heater. Although $\frac{1}{2}$ -in. pipe will serve the purpose, $\frac{3}{4}$ -in. pipe is recommended.

To recharge the softener, close valves B and E, Fig. 1. Then open valve A and when water starts to run from fitting A, open valve D. This starts a siphoning action, Fig. 2, drawing salt brine from the crock into the tank. Let the siphon operate until the level of the brine solution has dropped 6 in. or so. Then close valve D and open valve C. Water under full pressure then comes back into and through the tank, forcing the salt solution through and removing accumulated lime and other mineral substances. Let the water run with the valves in this position for 15 minutes or more. Then close valve A and open valve D to bring the salt solution back to the original level, forming brine for the next charge. Finally, close valves D and C and open valves B and E to put the unit back in operation. Salt must be added to the brine solution occasionally to keep it at full strength.



Glass Jar on Clothesline Post Keeps Pins at Hand

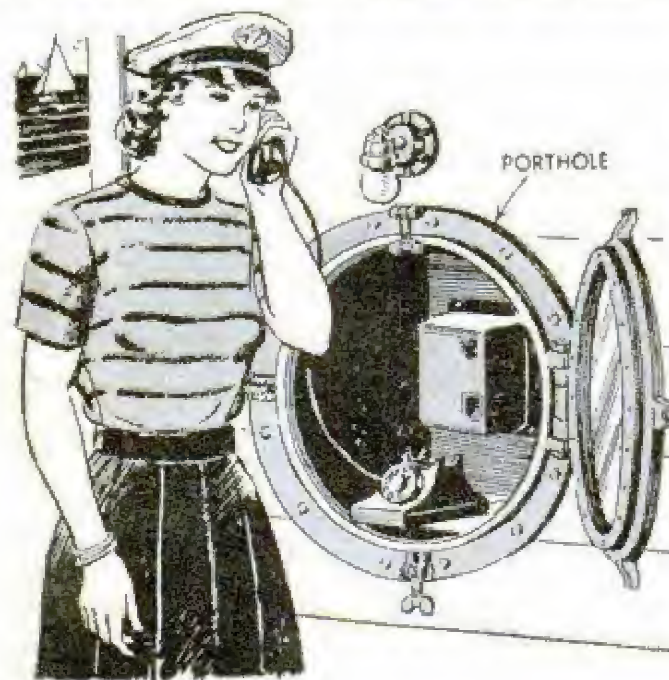


A few clothespins kept in a glass jar attached to a clothesline post is a real convenience when it comes to hanging a few items occasionally washed by hand. Attach the lid of a fruit jar to the crossrail and screw the jar into it.

Benj. Nielsen, Aurora, Nebr.

Ship's Porthole Serves As Door On Novel Phone "Booth"

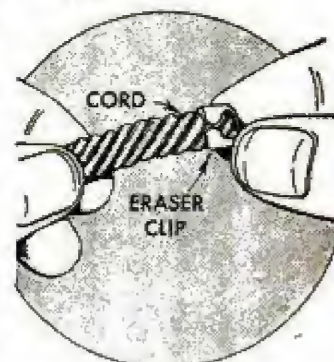
Desiring to have a telephone accessible from both inside and outside the boat-house, a member of one yacht club solved the problem of protecting the instrument against moisture and at the same time added a nautical touch to the building. First, a boxlike compartment, open on one side,



was framed in the side of the house and then a ship's porthole, obtained from war surplus, was mounted over the opening to provide a door. A small ship's-wheel lamp was fastened above the porthole to light the interior of the phone compartment. The brass parts were coated with clear lacquer after polishing.

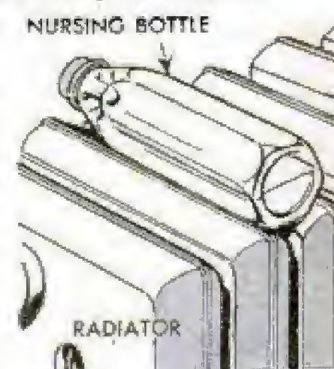
Nonfray Tips for Rope

The little metal clip attached to the eraser of a mechanical-type pencil has a new use when the eraser is worn out. It forms an excellent metal tip for the end of a tent rope or other rope which is threaded through grommets. Such clips are just the right size for sash cord or clothesline rope, and are attached by squeezing with pliers.



Radiator Warms Baby's Bottle

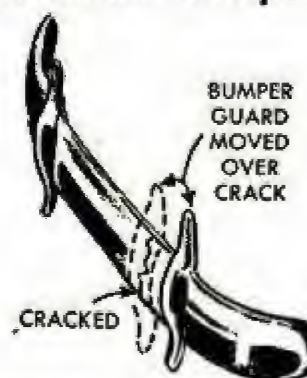
If your home is heated by hot water, the radiator in the baby's room can be put to good use as a nursing-bottle warmer. By placing the bottle on its side on top of the radiator as shown, it will take only a short time to warm the contents to the right degree. This hint will be found especially handy when baby fusses at feeding time and you wish to keep the bottle warm during this period.—Jack Miller, Gooding, Idaho.

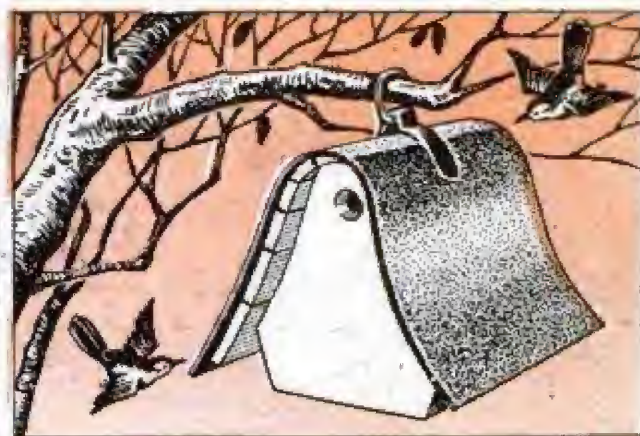
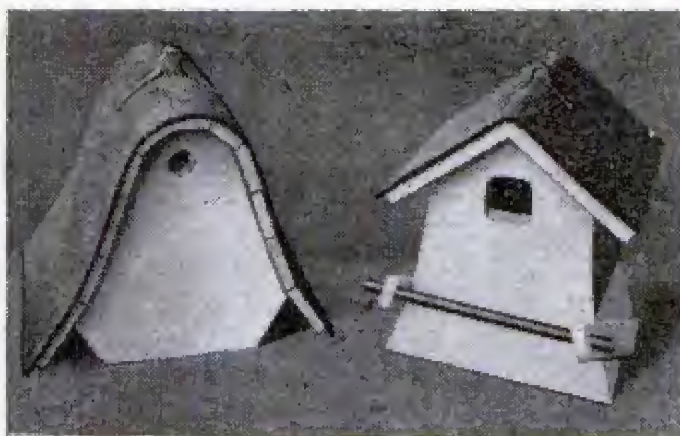


Guard Repairs Crack in Car Bumper

As a temporary repair for a cracked bumper, move the guard so that it will cover the crack and then clamp it tightly. This will hold the halves of the bumper in place until the crack can be welded or until the bumper is replaced. Use an extra guard if shifting one of those on the bumper would leave a fender end unprotected.

Barry Miller, Allentown, Pa.

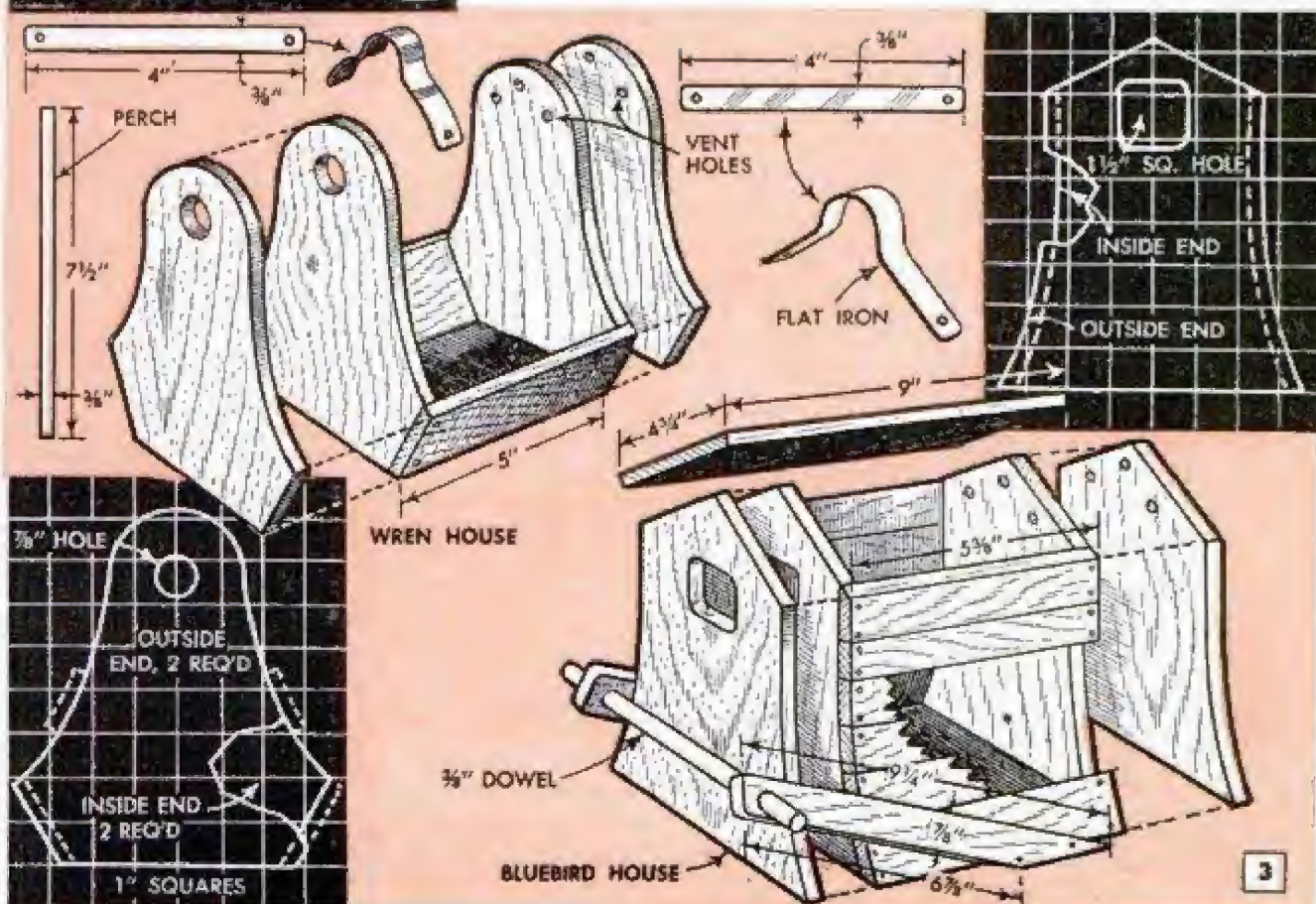




OUR FEATHERED FRIENDS NEED HOUSES TOO

BOTH the bluebird house, Fig. 1, and the wren house, Fig. 2, can be constructed easily from almost any $\frac{3}{8}$ -in. scrap lumber. Packing-box material is especially suitable for this purpose, but as it is surfaced only on one side, build the houses so that the smooth side is on the exterior. Assembly of both designs is indicated in Fig. 3. Double the front and back pieces, making the outer ones larger to cover the ends of the siding. Jigsaw duplicate parts to obtain identical shapes. The perch on the bluebird house is a dowel, mounted as shown. After setting the nails, fill the holes with putty, allow it to dry and then sand the surface. Apply two coats of outside paint, and cover the roof with pieces of asphalt shingle fastened with nails or roofing cement.

Dick Hutchinson, Alhambra, Calif.



THERE'S PROFIT in FARM PHOTOS



Good photos of farm scenes will make money for the photographer who knows how to select interesting subjects with composition and pictorial values characteristic of the farm and its seasonal activities

EVERYDAY rural life can be a source of educational, pictorial and human-interest pictures of infinite variety. Farm activities proceed on a twelve-month schedule, making outdoor action shots and pictorial photography possible on almost any day of the year that natural lighting conditions will permit. Simple record shots of unusual or especially attractive farm structures, such as the slab-sided water tower shown on the next page, the windmill, the rooster crowing defiance, cattle grazing, a farm gate in winter time, planting and harvesting scenes and photos of growing and harvested crops—all these commonplace farm scenes make interesting, salable pictures if taken with an eye to good composition. Essentials to correct composition are a natural pose of live subjects, a point of interest, plus a feeling on the part of the photographer for elements of atmosphere and character that make well-balanced pictorial values in a farm photo.

By Paul Hadley

Most farm photos taken outdoors necessarily include portions of sky. Sometimes as much as half of the film area will be brilliant blue sky, and this goes white on the prints, of course. That beautiful cloud formation you saw in the ground glass or in the view finder, disappears completely in the developing and printing. Even snow scenes, with no sky included, sometimes come out flat and patchy. This is due to the blue reflected from a clear or partly cloudy sky. To render true values in outdoor shots, you need a deep yellow filter to darken the open areas of the sky and bring out clouds in detail. Typical cloud formations in a farm pictorial photo give it depth and realism. As examples, see the photos of the windmill, shocked corn and heads of wheat.

Most experienced farm photographers use a camera fitted with a ground glass for critical focusing. However, some prefer the reflex camera in which the image can be viewed right side up until the instant of



Above, a rustic tower supports the water-supply tank for this farm. It's made from slabs trimmed to a uniform width. Below, you'll find few subjects more typical of farm life than these baby chicks



Above, it's only a picture, yet you can almost hear this rooster crowing, so real are the pose and action. Such a shot takes time and patience. Below, no wonder this pumpkin took the blue ribbon!





Country people know the time the mail carrier is due each day. This rustic mailbox is an example of photo possibilities you'll see along rural roads



It's harvest time—that's the simple story of this picture. Notice the clouds and bold shadows on the corn shock. A yellow filter gives this rendering



There's no figure in this winter shot of the pasture gate, but its pictorial quality calls for fine camera technique. Overcast sky gives promise of more snow



Friendly photographers get full cooperation from farm children. They like to pose for pictures. Pose them in familiar surroundings with something to do



This turkey gobbler, although not at all certain about the whole proceeding, quite obviously has decided to strike a pose just to see what happens



Here's one farm editors like to illustrate—a story about up-to-date methods of small-grain growing or similar subjects. Note low angle and cloudy sky

exposure. On pictorial shots, scenes where distant detail must be included, you would use slow shutter speeds and the smaller stop openings, in some cases as low as $f:32$. For this work a tripod is essential. Film size can be anything from 35 mm. up, but most farm photographers use the larger film sizes, 4 by 5 and 5 by 7 in., as these make acceptable contact prints. Probably the 4 by 5-in. film size is best for all-around work. Most cameras taking this film combine easy portability with ground-glass focusing and are provided with a removable lens board, making it possible to change lenses quickly for extremely fast action and wide-angle work.

Wherever possible, pose people doing something typical of everyday farm life. Work or play pictures are always interesting, both to farmers and others interested in farm activities. Even record shots and scenics will be made more interesting to editors and readers alike if a figure is unobtrusively included.



Above and below, work pictures shot without the subjects paying attention to the photographer or his camera. Such shots are nearly always good sales bets for farm publications





Adhesive Tape Over Ends of Film Protects Emulsion in Processing

If you process roll film without using a regular developing tank and fix or wash it by placing the roll loosely in a washbowl or other container, the sharp corners of the film are apt to scratch the emulsion side when the strip curls up. To prevent this, cover each end of the strip with adhesive tape as shown. This, of course, is done before the film is developed and the tape is attached under darkroom safelight or in total darkness, depending on the speed rating of the film. Usually there is sufficient leader on each end of the film to permit gripping it when attaching the tape so that any finger marks at this point on the emulsion will not matter.

Wall Easel for Enlargements

Here's a way of making a simple easel for holding enlarging paper flat when projecting enlargements onto a wall. Cut a piece of plywood or heavy cardboard the same size as the enlarging paper and glue masking tape to it, gummed side up, around the edge as shown. In use, the enlarging paper is pressed against the tacky surface of the tape, using paper or cloth to avoid finger marks, and then the easel is hung like a picture. After the exposure is made, the paper is peeled off and developed.

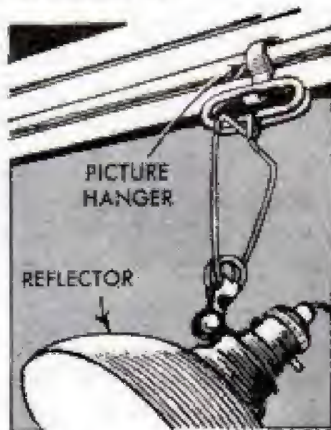
Kenneth Murray, Colon, Mich.



Picture Molding Around Room Holds Photoflood Reflectors

When using a curtain-covered wall for a backdrop and there isn't room to backlight the subject with a reflector on a standard, the picture molding around the room, if it has one, can be used to support a photoflood reflector of the clamp-on type. Hook a picture hanger over the molding and clamp the jaws of the reflector to it. Supported in this way, the light is out of camera range and can be moved and adjusted to highlight the subject as desired.

R. F. Donovan, Jersey City, N. J.



BUILD YOUR HOME YOURSELF

Springtime is building time when most of us begin to think of our dream house in specific terms and become impatient to see it become a reality. Of course, we are prejudiced, but we do not know of a better, more beautiful or practical design for the average home builder than our "Build-It-Yourself House." It can be built in any one of five styles—with or without a breezeway and attached garage—and you can have four, five, six or seven rooms; or start with four rooms and add others later. Best of all, you can build it yourself and save at least 50 percent of the cost. To help do this, we have prepared a book, *Your Home and How To Build It Yourself*, and a set of ten working-size blueprints.

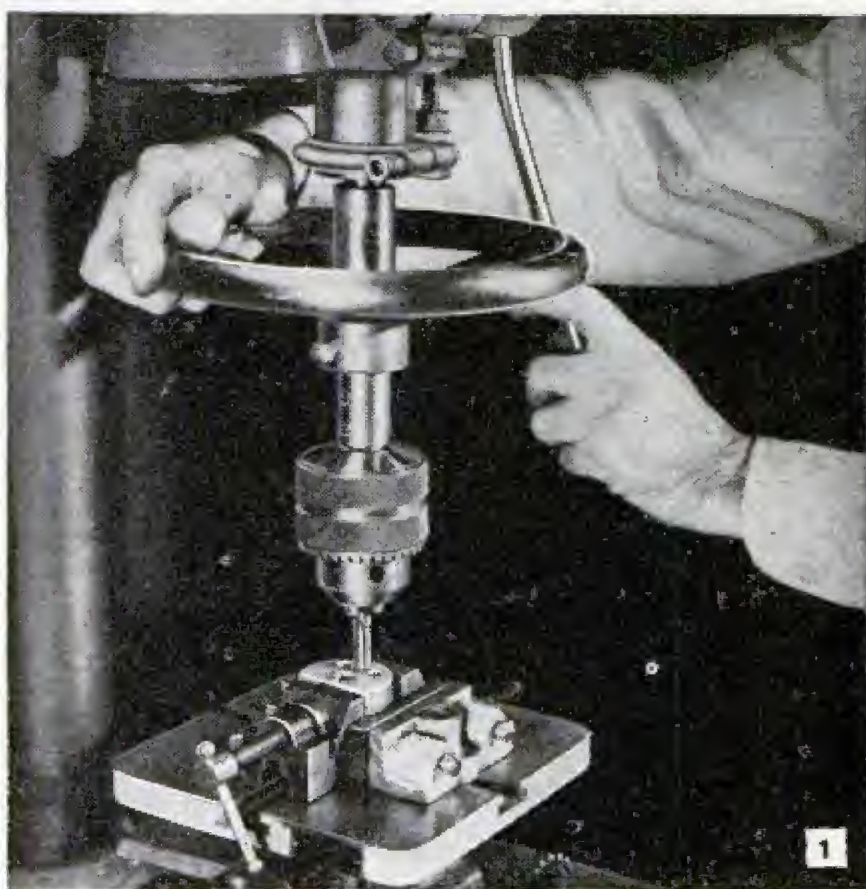
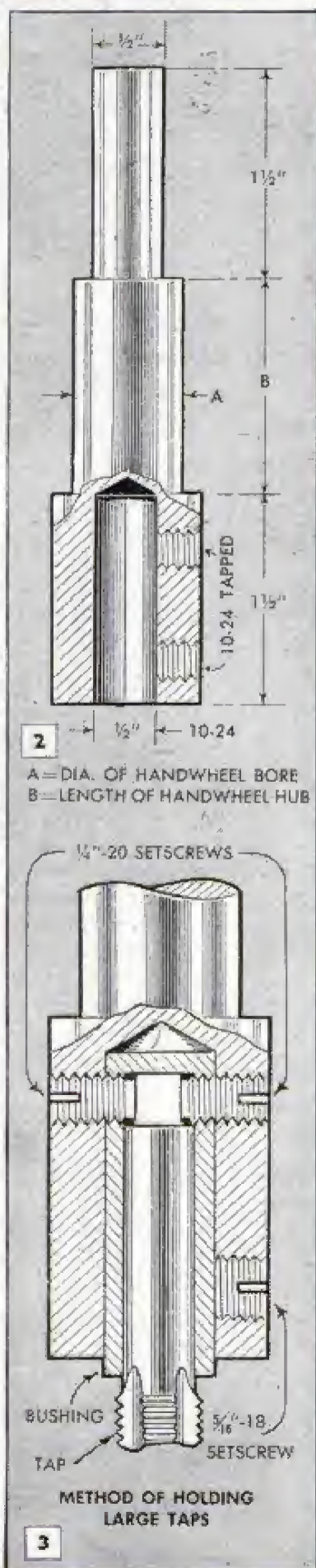
The book contains 100 pages—three fifths of

it consisting of photographs and working drawings. Several sections are printed in colors showing just how your own house will look. Every construction detail is given step by step and board by board, so that even the most inexperienced person can understand it. The blueprints give floor plans, elevations, etc.

If you do not care for this type of architecture or any of its modifications, the book will enable you to be your own architect in designing a home, or in remodeling your present one. Both the book and plans are available from our Book Department. The book, *Your Home and How To Build It Yourself*, sells for \$3.00, and the set of blueprints for \$12.50. Both in combination for \$14.00. Duplicate sets of plans are priced at \$5.00 each.



SHOP NOTES



DRILL-PRESS TAPPING ATTACHMENT

By Walter E. Burton

THIS ATTACHMENT makes a hand tapping machine of any small drill press. The unit utilizes the accuracy of the machine to guide the tap squarely into the hole, a trick that is quite difficult to do by hand with an ordinary tap wrench. Fig. 1 shows the unit in operation. By using the hand feed of the drill press and turning the tap with the large handwheel, a delicate feed is obtained which avoids tap breakage. No power is used, the tapping being done by hand.

To make the attachment, you need a true-running handwheel 8 in. in diameter, a length of 1-in. cold-rolled-steel shafting for the adapter, a key-operated chuck of $\frac{1}{2}$ -in. capacity, and several socket-head setscrews. The exact method of machining the adapter will depend on the type of spindle on the drill press and the method of mounting the tapping chuck. The adapter shown in Figs. 1 and 2 is attached to a drill-press spindle having a collar with a $\frac{1}{2}$ -in. hole and two setscrews for holding router bits, etc. It takes a drill chuck fitted with a $\frac{1}{2}$ -in. straight shank. Fig. 2 details the adapter for a straight-shanked chuck. It is machined all over and shouldered to three diameters. The hole drilled in the large end is reamed to finish diameter. Transverse holes are drilled and tapped for 10-24 socket-head setscrews. Machine the



other end of the adapter, Fig. 2, to a diameter of $\frac{1}{2}$ in. for a distance of about $1\frac{1}{2}$ in. This diameter will fit most drill-press spindles of the type shown. Drill and tap the handwheel hub for a $\frac{5}{16}$ -in. No. 18 socket-head setscrew. File a flat on the middle section of the adapter to provide a seat for the handwheel setscrew, and then bore and

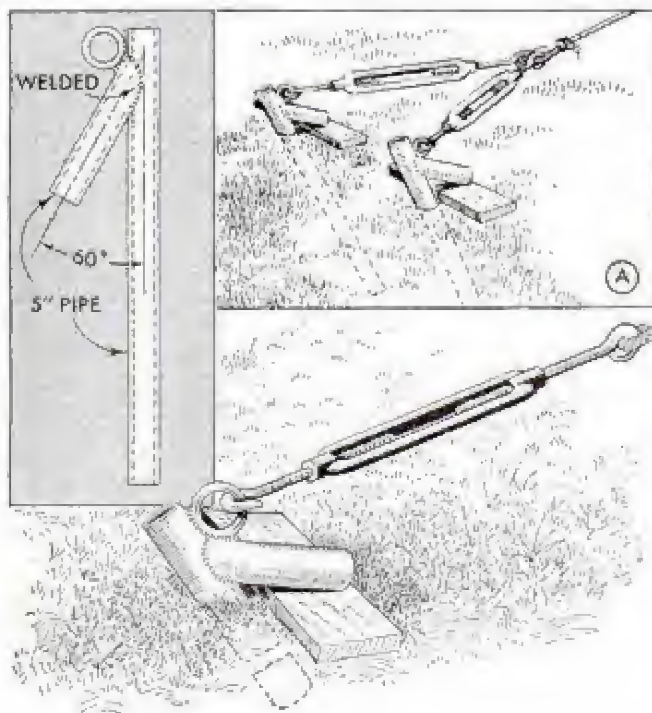
ream the handwheel hub to a tight slip fit.

A key-type chuck like that shown is satisfactory for taps up to $\frac{3}{8}$ in., but for larger taps a special chuck, Fig. 3, is needed. In construction, this is similar to the adapter shown in Fig. 2, except that it holds the tap by means of setscrews and bushings, several of which are made to fit varying sizes of taps. Notice that $\frac{1}{4}$ -in. No. 20 setscrews turn into holes drilled and tapped through both the adapter sleeve and the bushing, Fig. 3. The setscrews seat on the squared end of the tap, making a positive nonslip drive. The detail shows a closed-end bushing, the closed end acting as a stop when the tap is inserted. This provision is handy on short-run production, but open-end bushings can be used, of course. Fig. 4 shows the three parts of the unit required for installation on the average drill press. Careful machine work is necessary as any misalignment will cause repeated tap breakage. Work must be mounted securely on the drill-press table and tap holes should be drilled with the drill press to assure accuracy.

Pipe-and-Spud Guy Hitch Holds Fast in Marshy or Sandy Ground

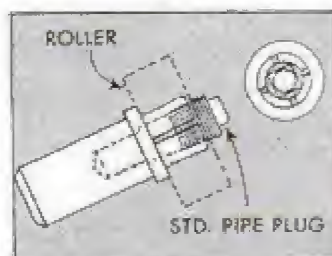
When it is necessary to guy derricks, cranes or other equipment in marshy or sandy soil where it is impractical to dig a pit for a deadman, the hitch shown will effectively anchor the guy. This hitch is made from a length of 5 or 6-in.-dia. pipe with the ends left open to enable it to be driven into the ground. A spud about 2 ft. long is welded at a 60-deg. angle near the upper end of the pipe, and an eye for a turnbuckle hook is welded just above the junction of the pipe and spud. To use this

hitch, drive the pipe into the ground so that the spud is almost flush with the surface and rest the end of the spud on a short plank placed at right angles to the direction of pull. The pressure of the spud against the plank and the resistance of the lower end of the pipe to being forced backward, hold the hitch securely. One of the main causes of a hitch gradually working loose is the transmission of vibration from the guy to the hitch. This often can be remedied by using two hitches, as shown in detail A, with the turnbuckles adjusted so that their lengths are unequal. This method also is efficient if two ordinary iron stakes are used for the hitches instead of the special pipe-and-spud assembly.—Elton Sterrett, Houston, Tex.



Mandrel Expands to Hold Work

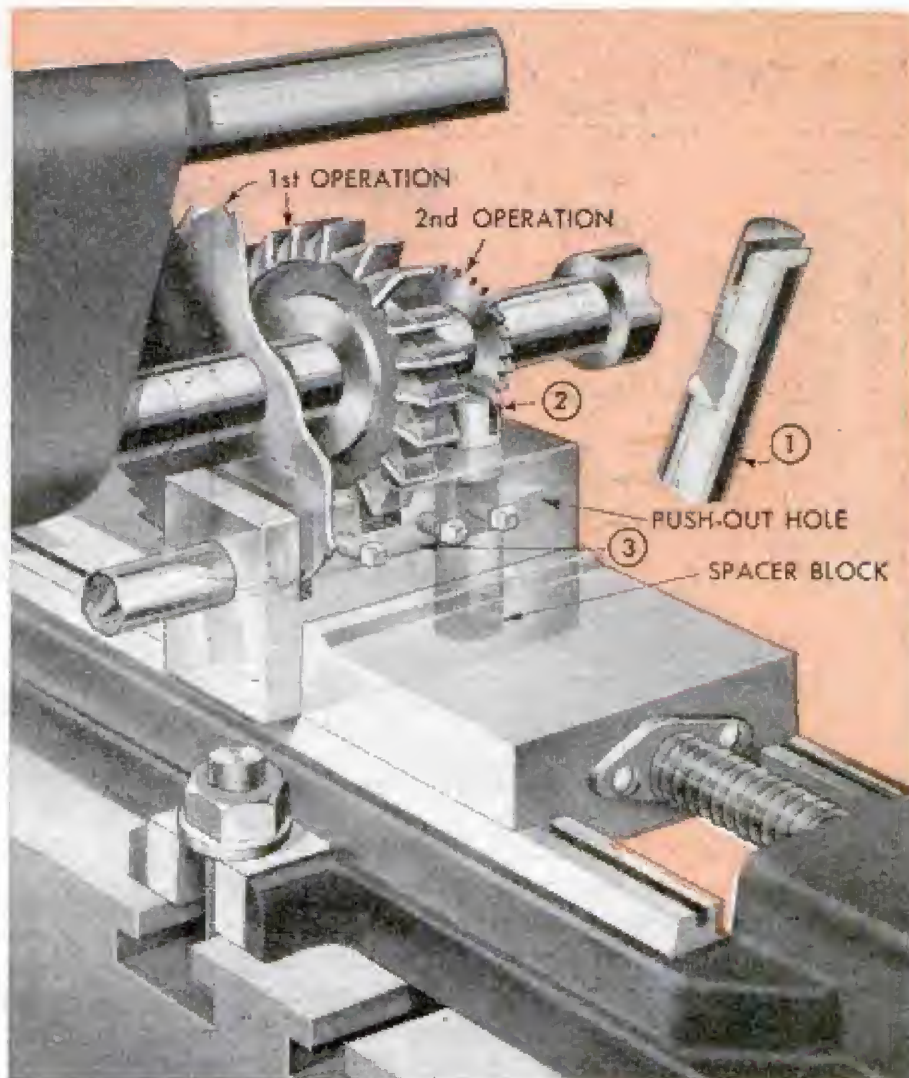
If you have a number of rollers or similar items to face, this expanding mandrel will permit them to be mounted and removed from the lathe



rapidly. Turn a shoulder on the mandrel to seat squarely in a 4-jaw chuck. Then drill, tap and slot end, as shown, to take a pipe plug. Tightening the plug after the work is mounted expands the end to hold the work.

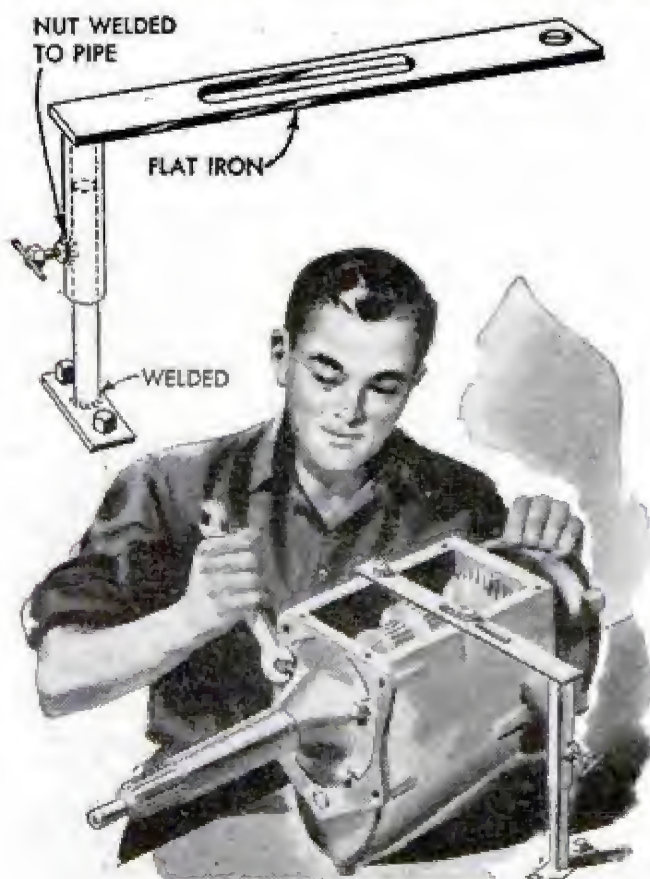
Setup Finishes Work In a Single Cut

This setup can be adapted to a considerable range of work that is milled from round stock. After the initial pass, one cut produces a finished part from that point on. The detail makes clear how this is done. The fixture is a milled rectangular block of steel slotted for the parting cut, drilled lengthwise, and also at right angles and then fitted with three setscrews, two on the long hole and one on the short hole. The initial operation as shown mills a flat and cuts off to length. The semifinished part is then pushed out through the push-out hole, dropped into the vertical hole and the setscrew is tightened on the flat. In this position, the part acts as a stop for the succeeding piece, Fig. 3. At the next pass the first piece is slotted, Fig. 2, the piece following is cut to length and the flat is milled. As the sequence is repeated each pass produces the finished part as in Fig. 1.



Care must be taken to see that the fixture is locked firmly in place.

H. Moore, Kirkstall, Leeds, England.



Adjustable Jig Holds Transmission Upright On Workbench

Dismantling an auto or truck transmission or a similar part on a mechanic's bench is a job that ordinarily requires the services of two men. But if this adjustable jig is used, one man can assemble or disassemble a unit and have both hands free for work. The jig consists of a rod with a mounting flange welded to one end and a slotted arm welded to a pipe sleeve, which telescopes over the rod. The sleeve is set at any desired height by means of an adjusting screw and nut, the latter being welded in place. Before welding, drill a larger hole in the pipe for the screw to pass through. The crosspiece has a bolt hole and a slot for fastening it to the top of the transmission. The slot accommodates transmission housings of different widths.

Clarence Purnell, Allentown, Pa.

Although it is recommended that cast iron be reamed dry, a little oil applied to the lands of the reamer will prevent the squealing noise made by a large reamer.

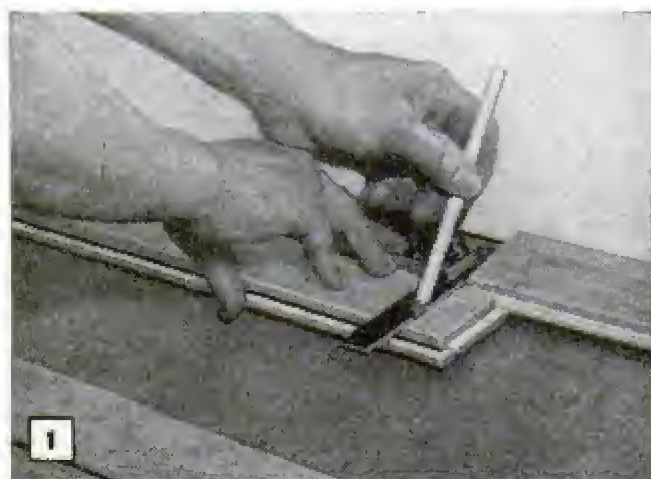
LAYING HARDWOOD FLOORING

By Charles H. Leach

This, the first of two articles on laying and finishing a hardwood floor, takes the homeowner and builder through the steps of laying the floor. Complete instructions on how to finish it, which also can be applied to refinishing an old floor, will be presented next month

IF YOU are one of many homeowners who have purchased an old-type house and are remodeling it yourself, few improvements will increase its value and improve its interior appearance more than beautiful hardwood floors. Whether the condition of present floors is beyond refinishing and requires resurfacing with thin flooring, or whether an old softwood floor is to be covered, almost anyone who is handy with a hammer and saw can do the job with excellent results. Most of the

This is how the last strip of each row is marked for length with a try square by placing it end for end against the wall and parallel with adjoining strip

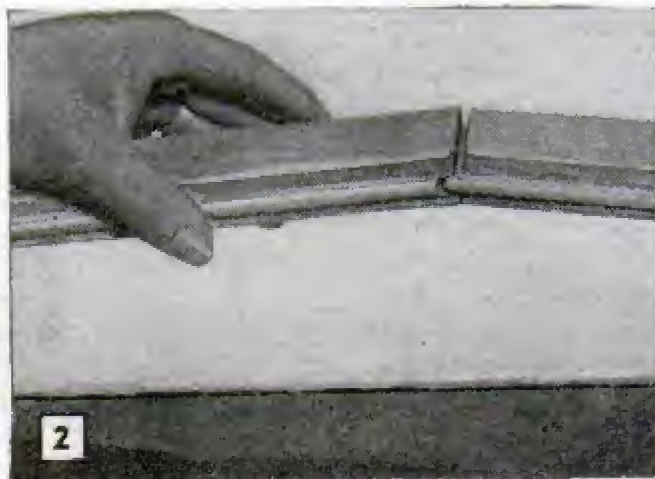


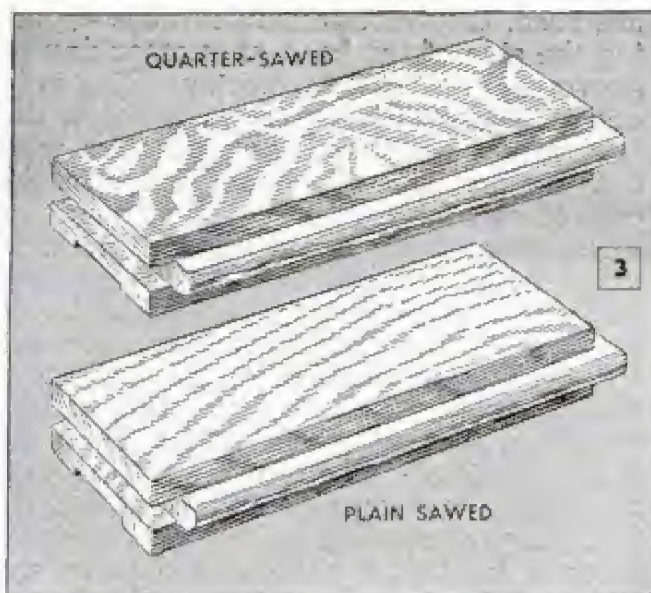
Photos by Roger Williams

tools required are common ones. Besides a hammer, you'll need handsaws for ripping and crosscutting, a nailset, a pair of dividers or a compass and a can of plastic wood putty to cover exposed nailheads where the flooring must be surface-nailed.

Types of flooring: The attractive grain of quarter-sawn flooring makes a beautiful job when waxed or varnished and, when available, is to be preferred to the plain or "flash sawed" type shown in Fig. 3. Quarter-sawn flooring is recognized by the wavy pattern of surface grain and by the slant of the growth rings in the end grain. It is somewhat more expensive than plain-sawn flooring, but has less tendency to curl and surface splinter. Flooring usually is sold in bundles of strips ranging in length from 2 to 12 ft. or more and end-

Flooring is sold in bundles of strips of random lengths up to 12 ft., which are end and edge-matched with a tongue and groove, and cup-molded on the underside

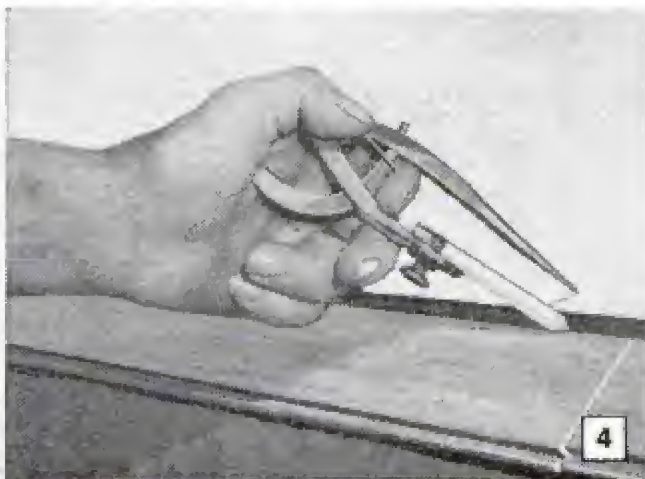




matched, Fig. 2, as well as edge-matched by a tongue and groove in the edge. The underside face of the strips is hollowed or cupped so that any unevenness of the subfloor will not interfere with their laying flat. Flooring can be had in four hardwoods: oak (white and red), maple, beech and birch. Oak flooring is available in strips of two standard widths and thicknesses. One measures $\frac{3}{8}$ by $1\frac{1}{2}$ in., the other $\frac{13}{16}$ by $2\frac{1}{4}$ in. The condition of the subfloor or nailing base determines largely the size and type of flooring to use. Some homeowners prefer a floor laid of narrow strips which are used in resurfacing an old hardwood floor and when the nailing base is solid. The $\frac{13}{16}$ -in. flooring generally is used over a rough subfloor or one that is not thick enough or properly reinforced to give adequate support to thin-type flooring.

Ready-finished flooring recently has been introduced which saves the work of finishing and the inconvenience encountered in waiting for the floor to dry. This feature is especially desirable when laying a new floor in an occupied house. It differs from regular flooring in that it has

Starting strip should be laid at right angles to side walls. If corners of room are not square, mark grooved edge of strip with compass to match wall



Finished with two coats of durable varnish, a hardwood floor will withstand rough usage by youngsters

a V-joint instead of a tongue and groove and, of course, it is stained, sealed or otherwise finished, ready for use as soon as it is laid. However, being prefinished, it requires great care in laying to avoid marring. To help reduce possible damage from hammer marks, the flooring is factory drilled for nails and is packaged for further protection. It naturally is considerably more expensive, as in addition to being finished, it is specially selected for straightness and uniform grain.

Keep flooring dry: Due to its low moisture content when kiln dried, flooring is highly subject to dampness and, until it is laid and completely finished, it is very important that it be kept dry at all times. This is especially so if the flooring is stored for any length of time prior to laying. It also is important that if laid during damp weather, the building be heated. If allowed to absorb moisture, a tightly laid floor will shrink when it dries out, leaving objectionable openings between the strips. In new construction, flooring should not be laid until the plaster has dried completely as it will absorb moisture from the walls.

Preliminary steps: The first step in laying a new floor is to inspect the old floor, or subfloor if it is new construction, for loose boards, ridges and any other high places that might prevent the new flooring from lying flat. Nail such places thoroughly to pull the boards down flush. This is important to assure a squeakless floor and prevent movement in the finished floor. In resurfacing a previously laid hard or softwood floor, it is advisable to remove the baseboard. This can be done without damaging the baseboard by locating the nails and driving them completely through and into the studs with a pin punch. Following this, the floor should be swept clean

and covered with a good grade of building paper, lapped at the sides and ends. Old softwood floors that are worn badly sometimes are covered first with plywood and special long nails used to apply the flooring. On new floors, the paper liner serves as a dust-and-draft barrier between the subfloor and finish floor, while on an old floor, which without doubt was originally laid over a paper covering, the new paper simply provides a smooth, clean, working surface.

How flooring is nailed: Flooring is nailed blind, in other words toenailed, so that the nailheads are hidden. This is done by driving the nails into the angle between the tongue and front edge of the strip as shown in Fig. 6. Use 8-penny wire flooring nails or special cut-steel flooring nails and drive them at an angle of 45 deg. Experience will enable you to drive the nails practically all the way with a hammer, as in Fig. 9. However, it is advisable at first to drive them part way and finish with a nailset to avoid the possibility of accidentally damaging the edge of the flooring. If cut nails

are used, they can be driven home by using the side of the head of another nail as shown in Fig. 7. The important thing is to drive the head flush or slightly below the surface so that it will not interfere with drawing up the subsequent strip. In the case of very hard woods, such as maple or birch, it may be necessary to first drill holes for the nails to avoid splitting, especially if wire nails are used. The blunt nose of cut nails will not split the wood as readily, as they punch through the wood. The nails should be spaced about 8 in. in laying $\frac{3}{8}$ -in. flooring and from 10 to 16 in. for thick flooring. It pays to nail a floor well to avoid later squeaks and loose boards.

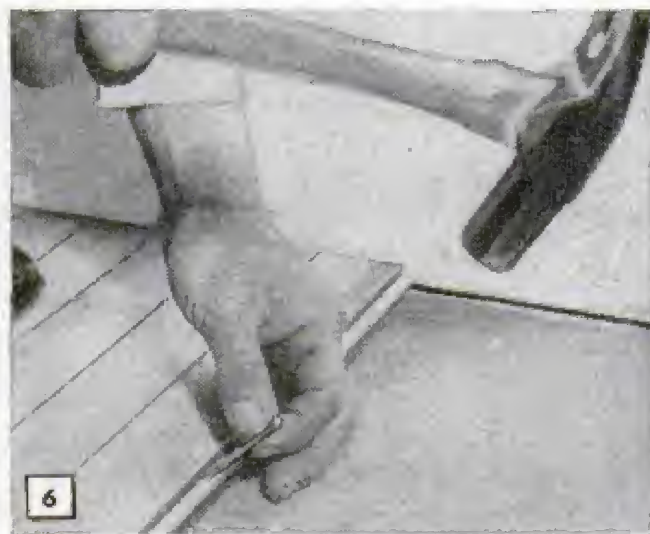
Laying the starting strip: If you are covering a badly worn hardwood floor, the new flooring is laid at right angles to the old. The first strip is selected for straightness and is laid with the grooved edge facing the wall and close enough so that the baseboard, if used, will cover any small opening. If the corners of the room are not square, the starting strip should be placed at a 90-deg. angle to the side wall, marked

When waste portion of the last strip in each row is a foot or more in length it is used to start next row

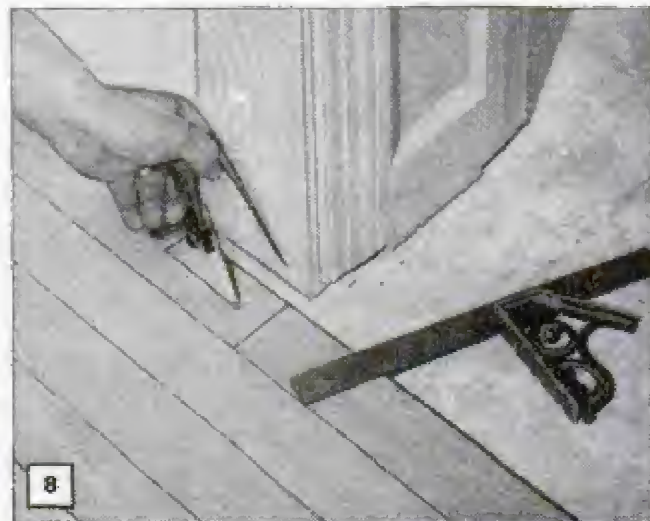
Blind-nail each strip by nailing in angle of tongue and edge. Use 8-penny nails driven at 45-deg. angle



Each nailhead must be set flush or slightly below surface. Side of cut nail or regular nailset will do

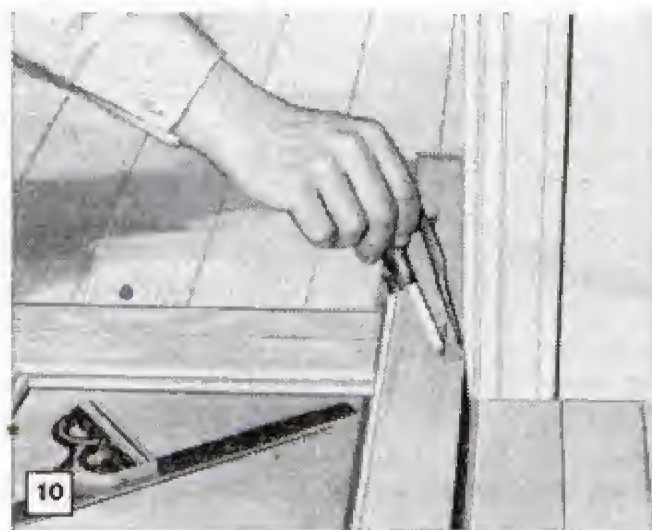


Pencil compass is handy for marking strips when fitting flooring neatly around or under a doorcasing

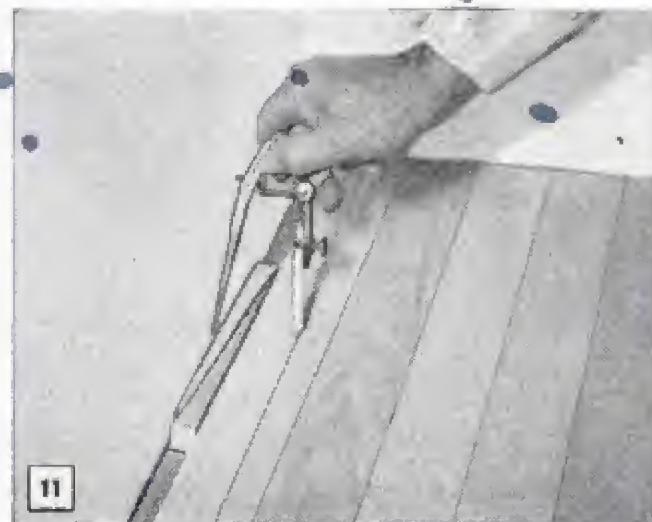


with a compass as in Fig. 4 and ripped to conform to the adjacent wall. This starting strip generally is face-nailed along the rear edge and sometimes it also is toenailed in the tongue. While it is best to have the starting strip in one piece, the size of the room may require several pieces laid end to end. In the latter case, if the piece cut off is greater than a foot in length, it usually is used to start the next row, Fig. 5. The last strip in each row is marked for length with a try square as in Fig. 1, after placing it end for end and against the wall. From here on it is a case of drawing the flooring strips of each row tightly against those of the preceding row to assure tight-fitting joints. For this purpose cut a scrap of flooring and use it to drive against. This will prevent damaging the tongue and will be found helpful in drawing up stubborn joints. Strips of flooring that are slightly bowed can be forced tightly against the preceding row by prying with a wooden block placed against a 2 by 4-in. lever and block temporarily nailed to the floor. The joints in each subsequent row always

Abutting strips are placed crosswise to the door opening when ending the floor at bathroom or kitchen



Final fill-in strip is marked to conform to wall by wedging full-width strip and marking with compass



Practice will enable you to drive nails rapidly from standing position. Heads are set later with nailset

should be staggered at least 6 in. or more.

Notching around doorcasing: When you must fit the flooring around or under the casing of a doorway leading to an adjacent room or closet, a pair of dividers or a compass is used to mark the depth of the required notch. Fig. 8 illustrates how this is done, the flooring in this case being fitted to butt against the casing. If you are resurfacing an old floor and wish the flooring to run under the casing and jamb, it will be necessary to saw off these two pieces to allow for the extra thickness. As shown in Fig. 8, the strip to be marked is not nailed but is simply tapped temporarily in position and butted against the end of the adjoining strip in the same row. Note that the joint of the adjoining strip ends flush with the face of the jamb. Now, measure the space between the loose strip and the face of the casing and set the compass so that this distance is marked on the strip when one leg of the compass is held in contact with the casing. Any slight cant or irregularity of the casing will be transferred to the strip assuring a perfect-fitting butt joint. The loose strip is removed and replaced with a full-width strip, the two strips being laid at the same time to enable wedging snugly in place. When the direction of the flooring runs through a doorway and you wish the new floor to end in

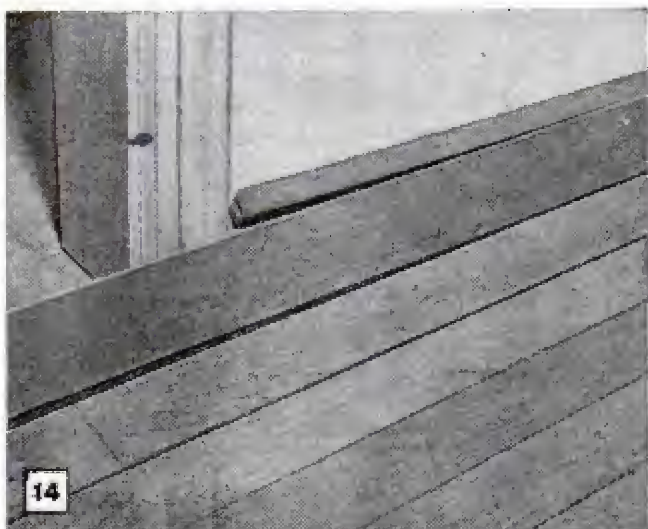


Bowed fill-in strip is forced in place tightly for marking by prying against wall with board and block

the center of the opening as in Fig. 10, the compass method is used as before to mark the strip to fit the jamb. Note here that one or two strips of flooring are first nailed down parallel with the opening and serve as header strips against which the flooring is butted. This generally applies when a hardwood floor is butted against a bathroom or kitchen floor which is to be built up flush and covered with linoleum.

Fitting final strips: If no baseboards are to be used and only a shoe mold, the steps in fitting the last remaining strips are shown in Figs. 11 to 15 inclusive. When the space remaining along the wall is less than a full width of flooring, the strip next to

To permit inserting the fill-in strip, last few strips are laid at same time to engage the matched edges



Drive nails part way and bend them over to support narrow fill-in strip flush with the rest of the flooring

the final one is set in place temporarily and wedged either with tapered blocks as shown in Fig. 11, or forced in place by prying as shown in Fig. 12. After this it is marked, as before, with a compass to transfer the contour of the wall, then ripped and used as a fill-in strip. Due to the fact that flooring is cupped or hollowed on the underside and ripping removes one supporting edge, a few nails should be driven part way into the subfloor and bent over, as shown in Fig. 13, to support the fill-in strip flush with the others. Actual laying of the fill-in strip and the last few strips is done at the same time, as in Fig. 14, so that the matched edges will go in place. Tapping with a hammer and wooden block will drive them into position as shown in Fig. 15. As the fill-in strip cannot be toenailed, it is face-nailed so that the heads will be covered by the shoe mold. Fitting the fill-in strip tightly is not so important when both baseboard and shoe mold are used, as together they will cover any slight gap that may remain along the wall.

Fill-in strips and others are gradually forced down with hammer and block. Then the strip is face-nailed



Homemade Orchard Sprayer Has Shielded Deck

By mounting a compressor and wooden sprayer tank on an old car chassis, one farmer built this orchard sprayer at a very reasonable cost. It will handle from two to four "broom" nozzles, depending on the size of the compressor used. The compressor is located between the motor of the car and the tank, and is operated by a dual V-belt drive. As the motor is used only to operate the compressor and tank agitator, the unit must be towed by a tractor or team. A canvas-shielded platform is erected over the compressor to enable the operators to reach the tops of tall trees. The canvas protects the men from wet branches when working in old orchards where the trees are close together. A cable-type control arranged on the platform will afford convenient operation of the motor from this position. The tank is filled through a trap door in the top, and an agitator inside keeps the spray mixture from precipitating. The agitator should be of the rotary type, driven from the motor by a V-belt and jackshaft. Spray hoses are connected to the outlets from the compressor and they should be long enough to enable the men to move about the orchard on foot or



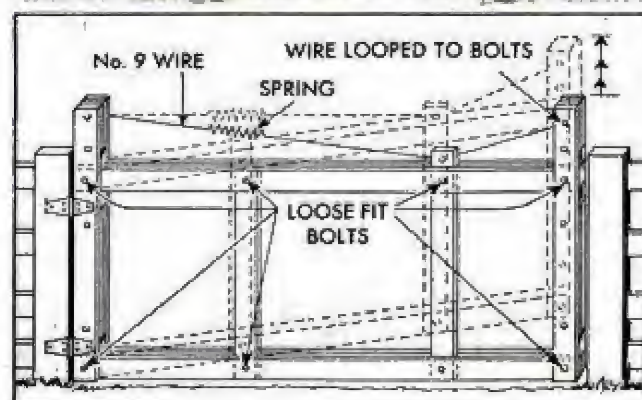
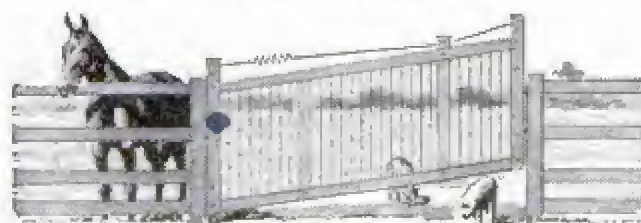
to stand on the platform. The dual rear wheels prevent the heavy unit from cutting in when used on soft ground.

A. M. Wettach, Mt. Pleasant, Ia.

Self-Raising Gate Elevates to Permit Passage of Small Animals

When this unusual stock gate is unlatched, the end automatically will rise several inches off the ground enabling it to clear rocks, snow and other obstacles when swung open. If provided with two

latches, one mounted a distance above the other, the gate may be left closed and in the raised position to provide a creep for smaller animals while still confining the larger ones. It is constructed and strung with barbed wire as shown.



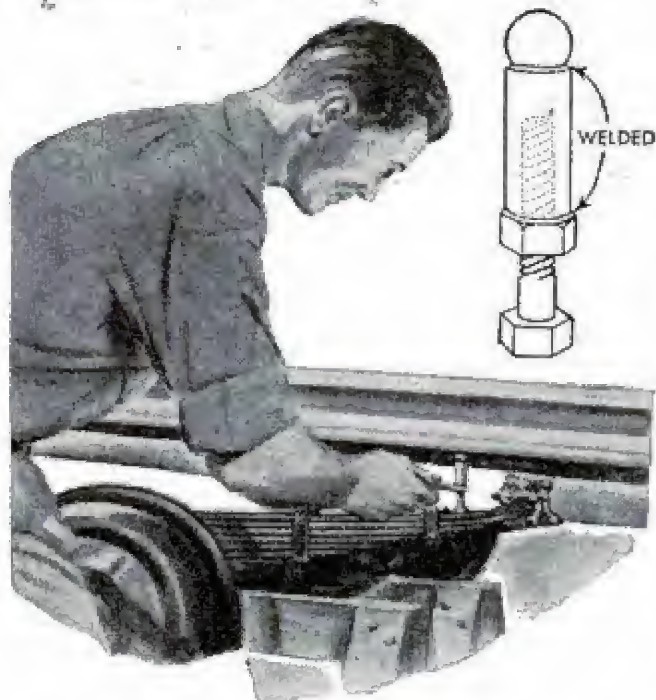
Rubber-Sheathed Drench Bottle

When drenching a sick cow or horse, the danger of the animal's breaking the neck of the bottle and swallowing a piece of glass is overcome by fitting the bottle with a rubber-hose extension as shown. This method simplifies drenching, as the hose is inserted in any part of the animal's mouth.

A. R. Stroda, Marion, Kans.

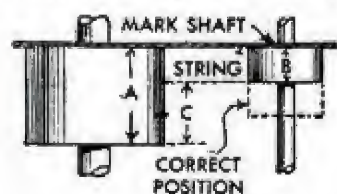


Handy Four-Piece Jackscrew For Close Quarters



Especially useful in making auto-spring repairs, this handy little jackscrew will have many other uses in both garage and machine shop. Just four parts are needed to make it, a steel ball, pipe nipple, and a cap screw and nut. The nut is welded to one end of the nipple and the steel ball to the other end, although the jack can be used with the ball simply resting in the end of the nipple. If the ball is welded in place, a stainless-steel welding rod must be used. The length of the nipple can be made to suit the job at hand. To use the jackscrew, the bolt is turned into the nut as far as necessary, and then an open end wrench is used to back the nut off the bolt, the latter remaining stationary as the upper part turns with the steel ball.

Centering Flat-Belt Pulleys



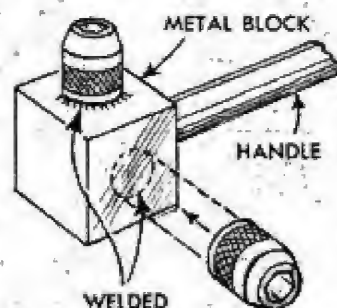
Lining up flat-belt pulleys of the same width is not difficult because it is merely a matter of aligning the rims, but where the widths of the faces differ, alignment is more difficult. Here is one way to do it: Assuming that the shafts are in alignment, line up one side of the rims of the pulleys by using a length of string or a straight-edge and mark the position on the relative shafts. Then measure distances A and B. Subtract B from A to obtain C and halve the result. The answer is the distance that the narrower pulley must be moved away from its mark on the shaft. To illustrate

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this, if A is 9 in. and B is 3 in., the difference is 6 in. One-half of this is 3 in. Therefore, the narrower pulley must be moved 3 in.—W. F. Schaphorst, Newark, N. J.

Multiple Wrench Has "Turret Head"

Instead of having to carry four sockets and a wrench handle when working on a car, make a multiple tool which has all four sockets in one head. Use a solid metal



block for the head and weld the sockets to it, making a light weld to avoid heating them and withdrawing the temper. If the sockets are alloy steel, it will be necessary to use a special welding rod designed for that particular metal.

Doorknob "Eggs" in Hens' Nests Fatal to Egg-Stealing Snakes

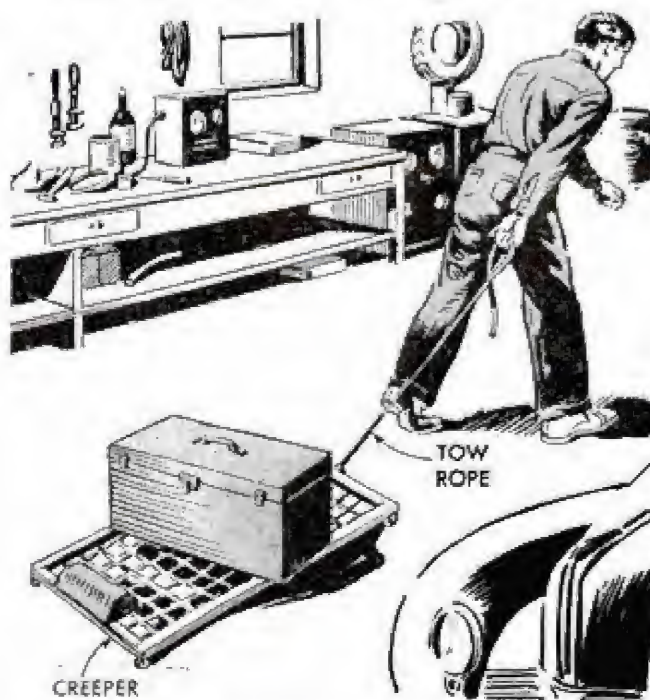
One farmer found that when he placed white doorknobs in hens' nests, egg-eating snakes, believing they were eggs, would swallow them and die. By doing this, he was able to rid his buildings of the pests.

William Allen Ward, Dallas, Tex.

Creeper Used as Dolly

If a towrope is tied to a creeper, it will serve as a dolly to move large tool chests about the garage. This eliminates the necessity of having two men carry the box. A large number of repair parts can be moved in the same manner.

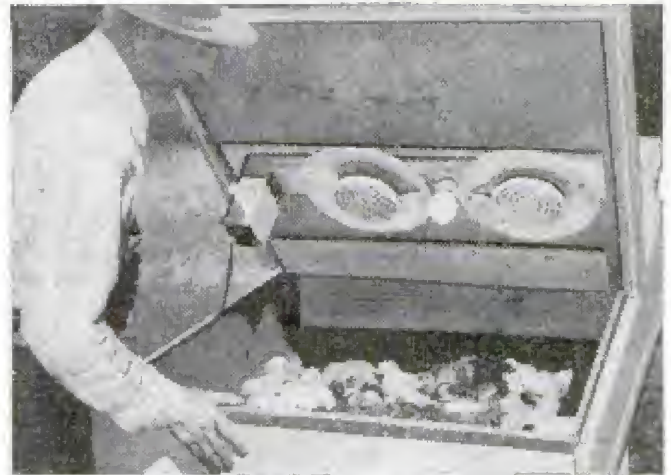
Marvin H. Doughlass, New Bern, N. C.



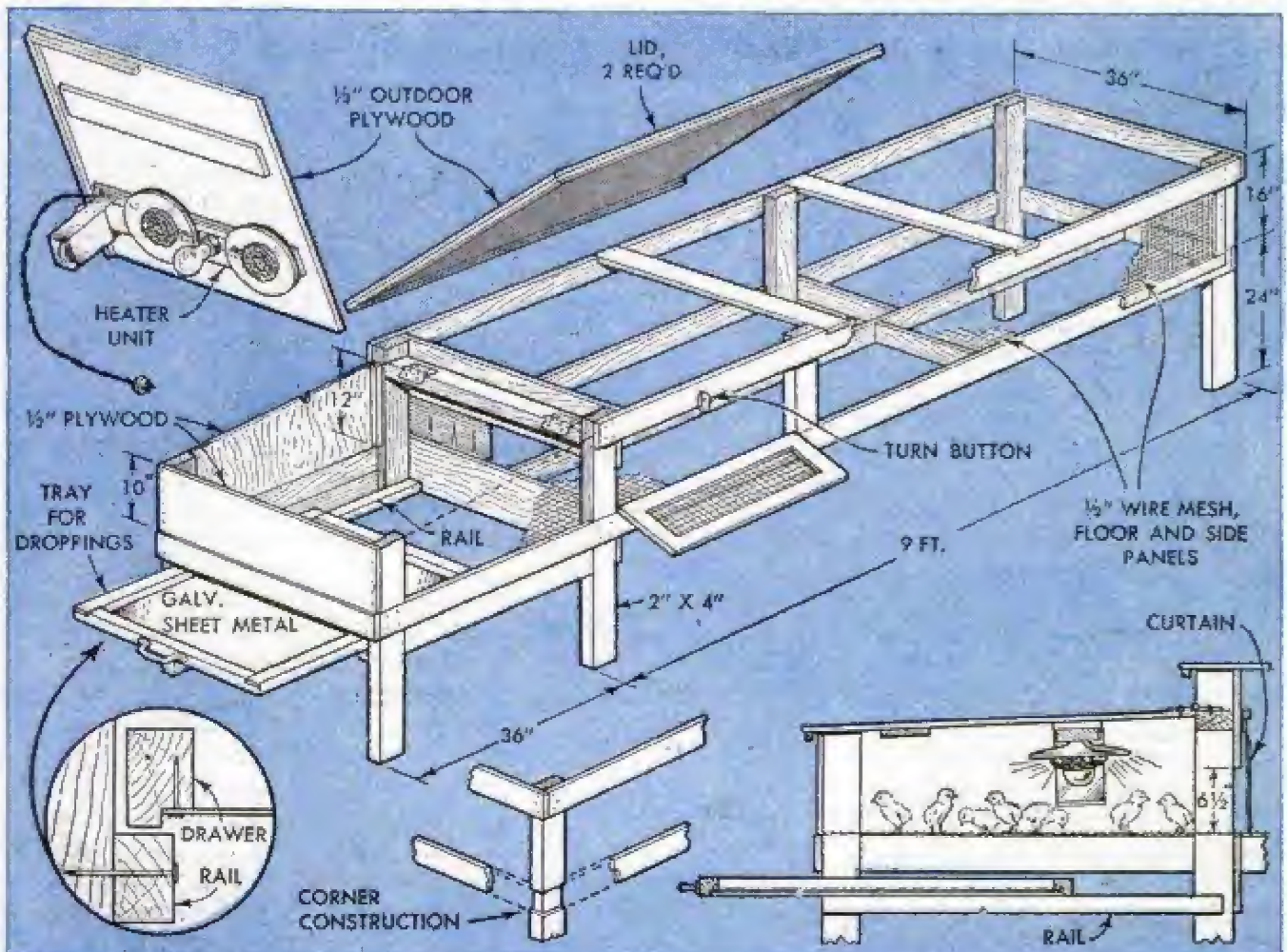
100- CHICK BROODER AND RUNWAY



This wire-floored brooder is designed to accommodate 100 chicks from hatching time to the age where they can be released on open range. Wire floors of both the brooder and runway are 24 in. from the ground, a special feature of the design which makes it convenient to replenish the food and water supply and, at the same time, protects the chicks from rats and other vermin. A thermostatically controlled heating unit is installed in the hinged plywood cover, or roof, of the brooder. A hinged door shown on one side of the runway gives access to the interior, and a two-section plywood lid covers the runway to shield the chicks from the sun.

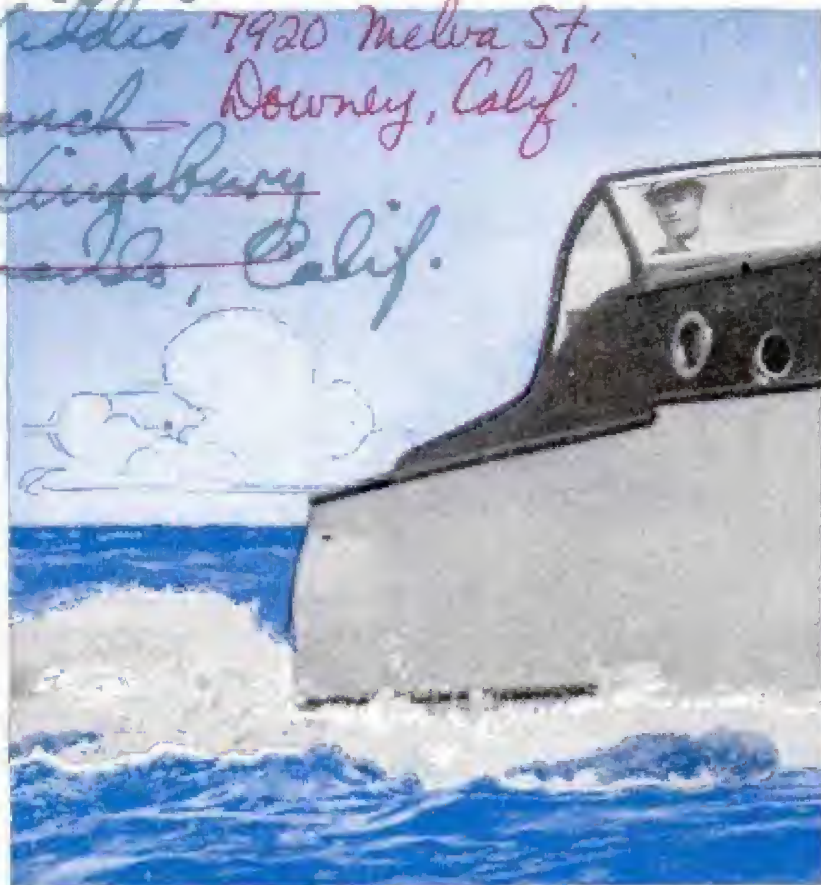


Wire floors in brooder protect chicks from vermin and disease. Heater maintains constant temperature





*Ed. C. Widdis 7920 Melva St.
 4-W Ranch Downey, Calif.
 17308 Kingsbury
 San Dimas, Calif.*



How to Build

"SEA CRAFT"—a 25-ft.

IDEAL for use on large lakes or rivers, and fully seaworthy for offshore ocean cruising, "Sea Craft" was designed with an eye toward simple, low-cost construction for the inexperienced boatbuilder. During World War II, the original boat was given severe tests for seaworthiness when it was used by the United States Coast Guard to take high-ranking officers from ship to shore. The boat has an over-all length of 24 ft., 7 $\frac{5}{8}$ in., and a breadth at sheer of 7 ft., 8 $\frac{3}{4}$ in. A converted Chrysler "75" auto engine easily pushed it along at a cruising speed of 15 knots. However, any marine or converted auto engine of similar horsepower could be used.

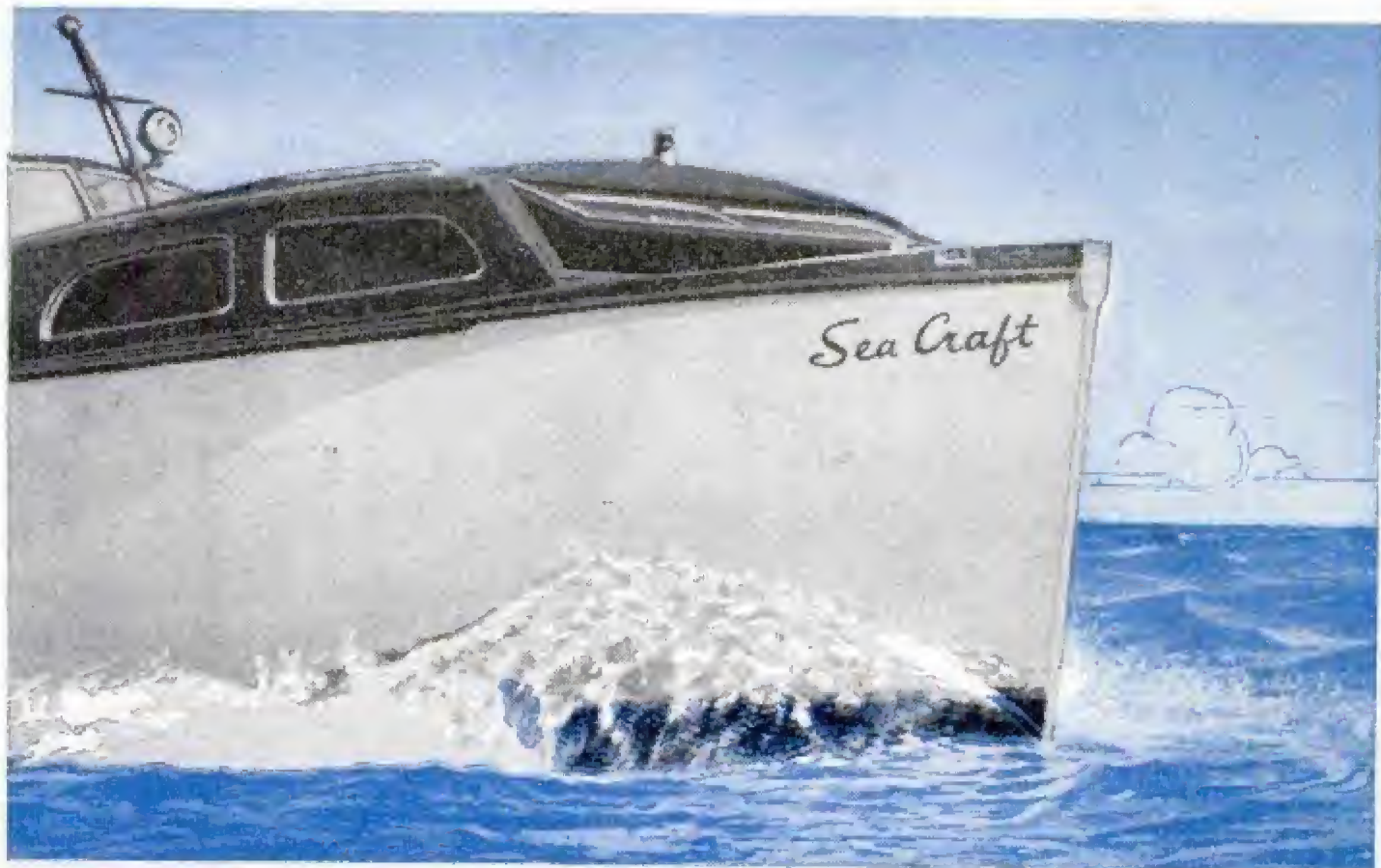
Although this article describes the building of a sedan cruiser, this particular hull, with a few changes in the cabin construction, is readily adaptable to a sport fisher, express cruiser or utility boat. The cabin design of Sea Craft was selected because it offers one of the best all-around accommodations. Its open cockpit is large enough for fishing, lounging or sun-bathing and the roomy cabin provides comfortable living quarters on a long cruise. It is equipped with a fresh-water tank, sink, cooking stove, toilet and two bunks. Two additional upper bunks can be fitted to sleep a total of four. In addition, there is

Part 1

plenty of cabinet and stowage space. The photo, Fig. 1, shows the cabin interior looking forward.

Laying out, cutting and assembling the keel and rib structure is by far the most important operation of building the boat. As this framework is the backbone of the entire boat, the performance and beauty of the craft will depend upon the accuracy and skill with which the framework is constructed. As previously mentioned, the type of cabin, engine and even decking can be changed to suit the individual builder's fancy, but no changes should be made in the hull if the proven performance of this cruiser is to be maintained.

The first step in building a boat of this size is lofting, that is, drawing the profile, the plan view and the body-plan views full size on paper, as shown in Fig. 4. These drawings are cut out to serve as patterns for marking and assembling the hull frame. Full-size, cutout patterns of the keel and ribs are available to those who care to purchase them. If you intend to make your own patterns, get a roll of heavy wrapping paper and edge-lap and glue enough strips together to make up the required width for the height from the base line to the top of the stem shown in the profile view, Fig. 4. The paper is tacked down on a wooden platform—a

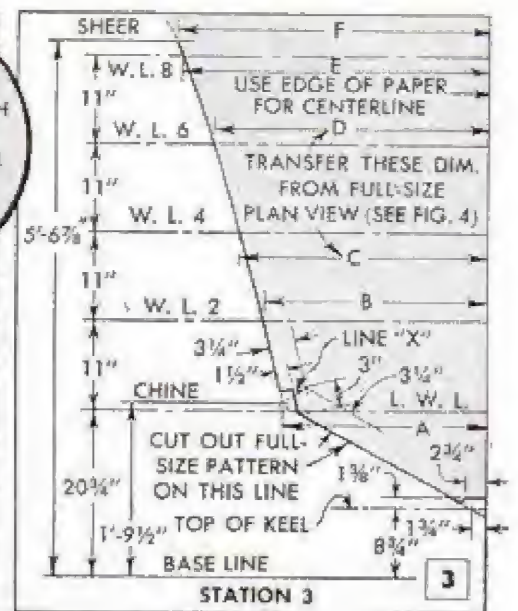


Cabin Cruiser

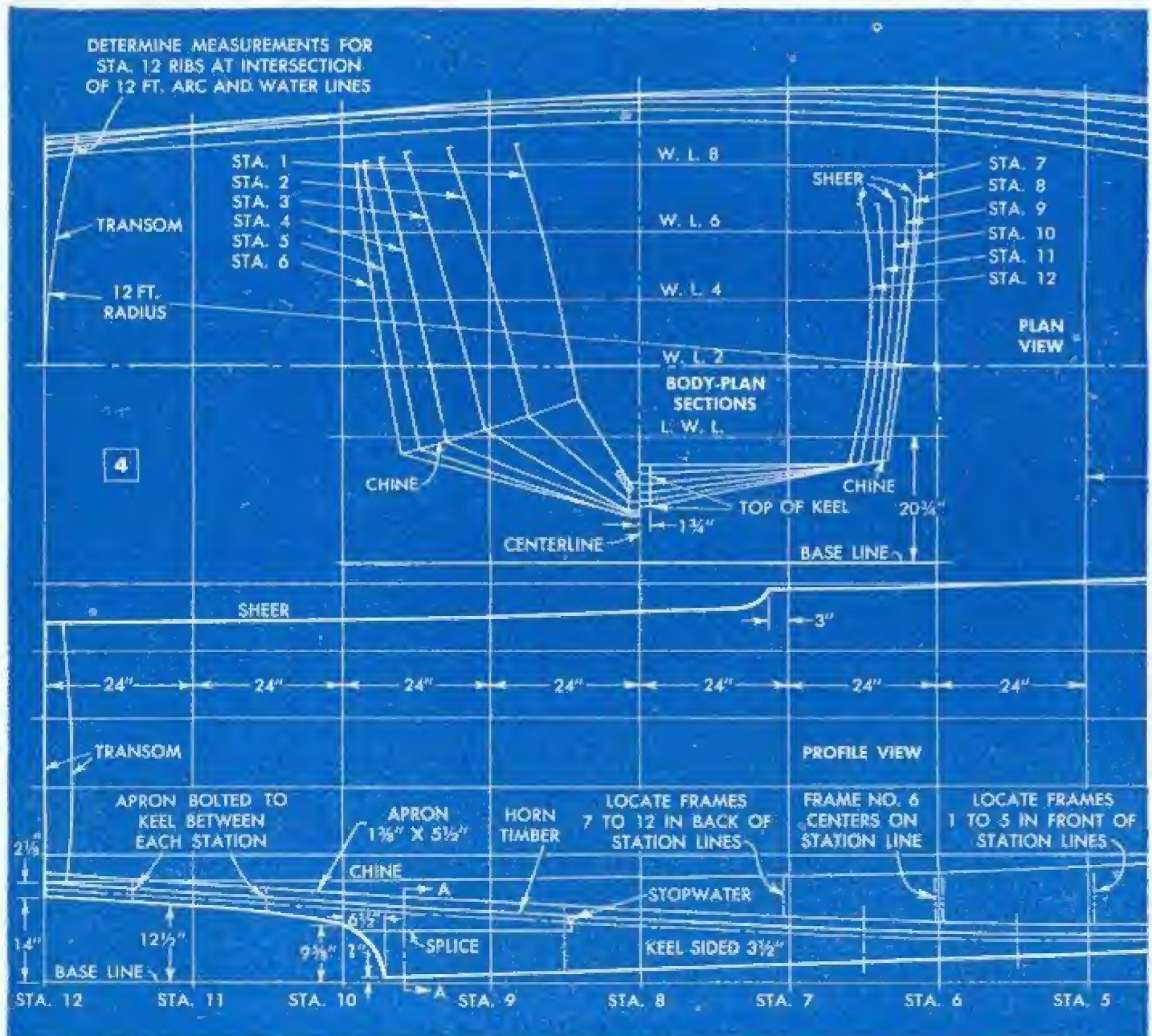
By EDWARD COLBY
Designed by H. M. WILSON



Large roomy cabin with sleeping accommodations and galley provides comfortable quarters on long cruises



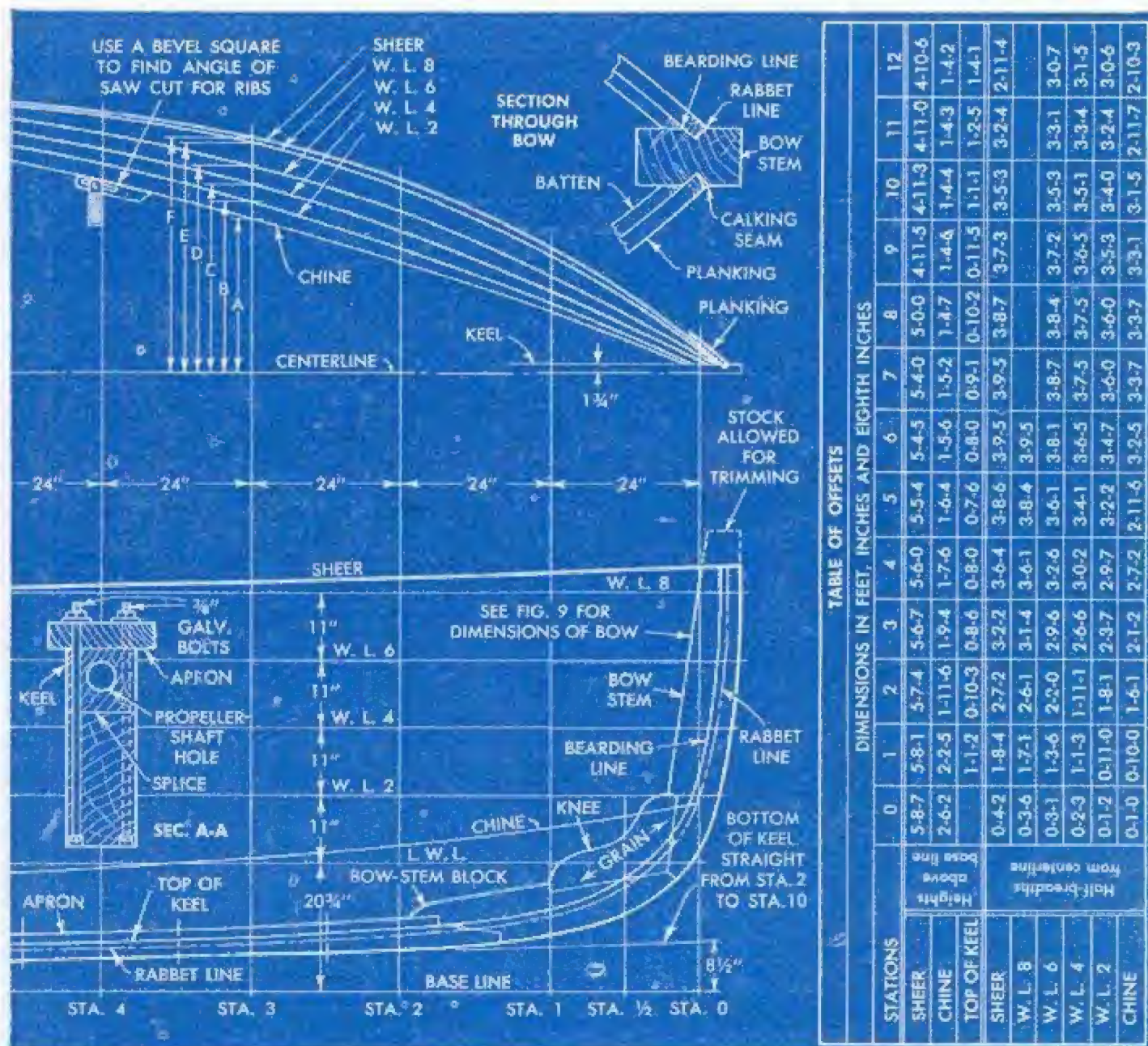
Above, full-size half pattern of each station is drawn on heavy paper. Left, the natural curve of a wooden batten is used to mark curved line connecting half-breadth dimensions

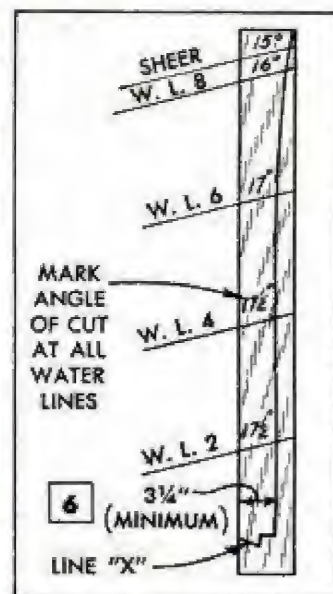


floored attic is an excellent place—and the profile view is drawn first. With a long straightedge or chalk line, lay down the base line, load water line (L.W.L.) and water lines (W.L.) from the dimensions given in Fig. 4. Then mark off the station points from 0 to 12, spacing them 24 in. apart along the base line.

In the table of offsets at the right in Fig. 4, refer to the column which reads "top of keel." Note that station 0 is blank because at this point the top of keel runs into the bow stem. At station 2 the top of keel is the bearding line. Station 3 reads 0-8-6 which means the top of the keel is 8 $\frac{3}{4}$ in. above the base line at this point. All figures in the table of offsets are in feet, inches and eighth inches. For example, the 6 for station 3 indicates $\frac{6}{8}$ in., or $\frac{3}{4}$ in. Measure this distance from the base line along the No. 3 station line and mark it. Follow this procedure at all station lines, marking each top-of-keel point. Drive a small nail through the paper into the floor at each

mark and bend a $\frac{3}{4}$ by 1-in. batten against the nails. It will be necessary to place nails on both sides of the batten at some stations to hold it in place. The batten should be straight-grained wood that will bend easily without any irregularity in the curve it takes. It should be somewhat longer than the length of the boat as it will be used later to fair the sheer, chine and water lines in the plan view. When the batten is in position, transfer its curvature to the paper by drawing a line along it. This is the shape of the top of the keel. The bottom of the keel is straight. Measure 8 $\frac{1}{2}$ in. above the base line at station 0 and 1 in. above the base line 6 $\frac{1}{2}$ in. forward of station 10. Then connect the two points with a line drawn along a straightedge or snap a chalk line. The sharp curve at the aft end of the keel can be drawn free-hand, or with a French curve. The chine and sheer lines are drawn in by the same method used in plotting the top-of-keel line. To draw in the bow stem, knee and





Angles of saw cut marked on ribs, above, are called off by bandsawyer, left, as a helper tilts table

bow-stem block, follow the dimensions given in Fig. 9. Use a light, flexible batten to fair in the curves. Carefully mark the rabbet and bearding lines, as these must be transferred to the bow-stem pieces after they are assembled.

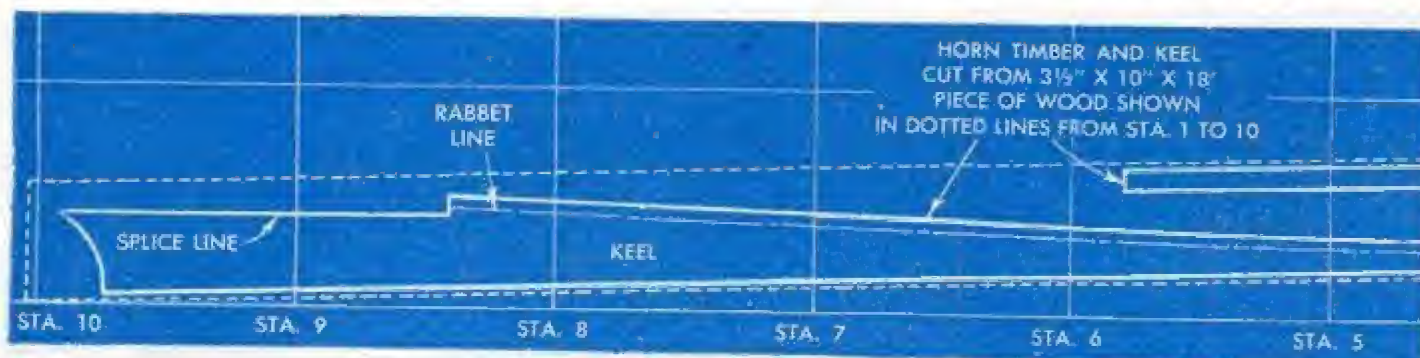
To transfer the lines to the wood, cut the paper along the bottom of the keel and forward edge of the bow stem. Do not cut the other lines as the pattern will be used later to lay in the propeller-shaft angle and motor mounts. The uncut lines can be transferred to the wood by rubbing the underside of the paper with a soft pencil and then tracing over the lines in a manner similar to that of using carbon paper. However, no cutting should be done until all other patterns have been made.

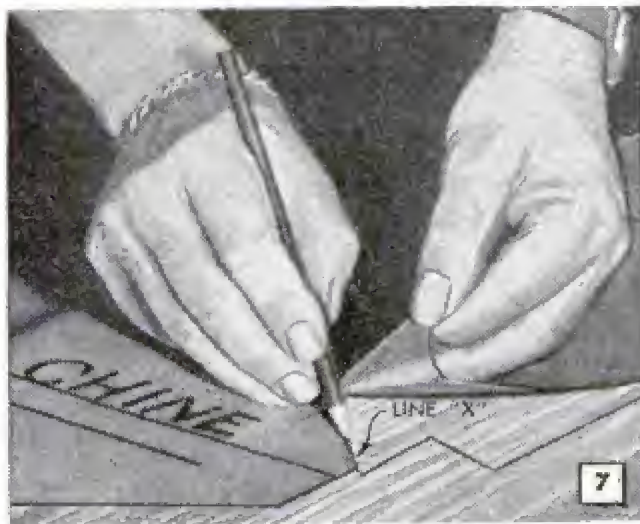
The keel is made of oak, apitong or straight-grained Douglas fir, and is assembled in two pieces cut from a single piece of timber as indicated by the dotted lines in Fig. 9. The aft section, known as the horn timber, is spliced to the keel proper as shown in the profile plan. Be sure to place the bolts off-center so they will not interfere when drilling the propeller-shaft hole through the keel, see section A-A, Fig. 4. The keel apron also

should be oak, apitong or Douglas fir, 1¾ in. by 5½ in., and extends from the bow-stem block to the transom. Bolt the apron to the keel between the stations. The dot-dash lines through the bow-stem parts in Fig. 9 indicate where to bolt them together.

A plan view, as shown in Fig. 4, must be drawn full-size in the same manner as the profile view. First, lay down the centerline and then draw perpendicular lines across the paper at each station point. These station lines should be labeled clearly. Refer to the table of offsets in the chine column of the "half-breadths from centerline," and measure off the distance given from the centerline.

For example, read across the chine column under station 3, measure off the distance 2-1-2, which is 2 ft., 1¼ in., and mark the spot. This is shown as dimension A in Fig. 4. Then drive a small nail at the mark. Follow this same procedure at each station for the chine, and bend the long batten against the nails. When fairing the line, it may be found that the batten will clear some of the nails by ¼ in. or ⅛ in. This is not serious. The important thing is to have the curve follow the natural bend of the batten. When the batten fairs up nicely and





has a smooth, flowing curve, which you can see by sighting with your eye, draw in the line. Use the same method for all the water lines and the sheer line until you have a full-size drawing of the plan view as in Fig. 4. To avoid confusion later, draw each line a different color.

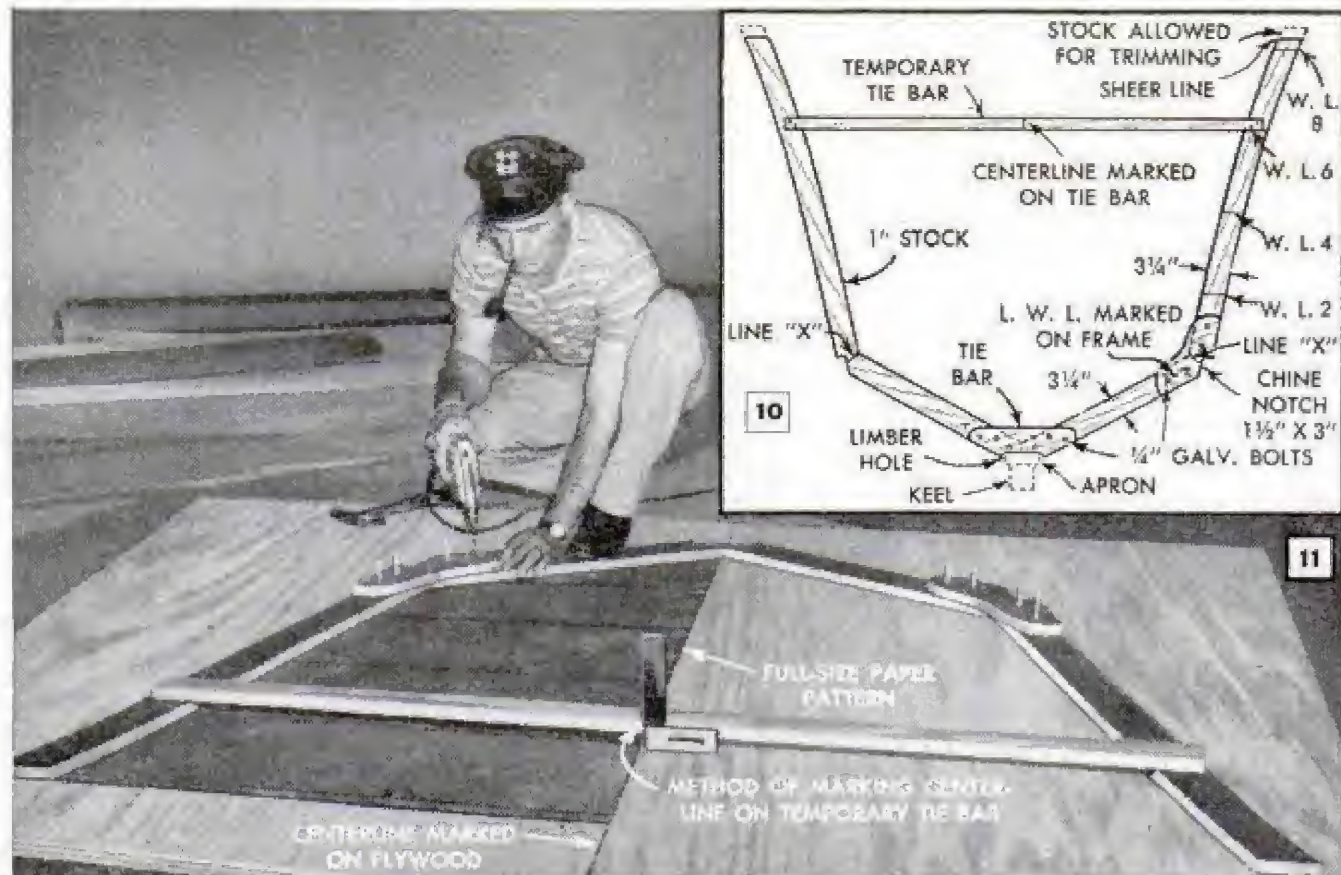
Full-size drawings of the body-plan sections, Fig. 4, become patterns for marking the ribs and assembling the frames. Cut a piece of paper for each station. The paper must be perfectly straight along one of the long sides which is used as a centerline. Draw a base line at right angles to the centerline, 2 in. from the bottom edge. Taking station 3 as an example, draw in the load water line and water lines 2, 4, 6 and 8 parallel with the base line from the dimensions given in Fig. 3. These lines are spaced the same for all stations. Identify each line.

The table of offsets is not used to draw in the lines for the rib patterns. All dimensions are taken from the faired lines of the full-size plan and profile drawings. On the profile drawing, measure up from the base line for the top-of-keel, chine and sheer lines at station 3 and transfer them to the station-3 rib pattern. From these points, draw lines parallel with the base line and identify each. On the plan view, measure the distance from the centerline to the chine (see dimension A, Fig. 4) and mark this distance on the chine line of the pattern by measuring in from the edge of the paper used as a centerline. Follow the same procedure in transferring dimensions B, C, D, E and F, Fig. 4, to their corresponding lines on the rib pattern. Drive a nail at each point marked, fair a batten against the nails, and scribe the line as in Fig. 2. Using a straightedge, scribe a line from the point marked on the chine line to a point $1\frac{3}{4}$ in. from the edge of the paper on the



A compass or marking gauge set at $3\frac{1}{4}$ in. is used to scribe a line conforming to the contour of the outside edge of rib. This becomes the inside edge of the rib





Ribs, gussets and tie bars are assembled directly over full-size patterns to assure exact alignment. Builder is shown drilling bolt holes through gussets and ribs. Note how centerline is marked on temporary tie bar

top-of-keel line. Dimensions for the notch over the keel apron and limber holes, indicated in Fig. 10, are given in Fig. 3 above the top-of-keel line. These dimensions apply to all stations except stations 1 and 2, which are slightly narrower because the apron tapers to $3\frac{1}{2}$ in. where it joins the bow-stem block.

To draw in the notch for the chine batten, draw a line parallel with and $1\frac{1}{2}$ in. from the faired line at the chine end. Measure 3 in. along this line from where it intersects the straight line from the chine to top-of-keel. All chine notches are made the same way with the exception of station 1, shown in the inset of Fig. 2. Line X, Fig. 3, indicates where the two ribs join and is located by scribing a line from the point of intersection of the straight and faired lines to the point of intersection of two lines drawn parallel with and $3\frac{1}{4}$ in. from the straight and faired lines. Cut out the pattern as indicated by the shaded area in Fig. 3, allowing it to extend about an inch beyond the sheer line for trim. Also make a cut on line X to mark the ends of the ribs as shown in Fig. 7. All rib patterns are drawn and cut out as previously described, except station 12 for which the following method is used: On the full-size plan view strike a 12-ft. arc extending across the chine, sheer and water lines with a string centered at station 6. To determine the half-breadth dimensions for

station 12, or the transom, measure the distance from the centerline to where the arc crosses the water lines.

Use oak, apitong or vertical-grained Douglas fir, 1-in. thick, for rib stock. Each frame, with the exception of station 1, has four ribs held together with gussets and tie bars as shown in Fig. 10. Station 1, being narrower, requires only one rib on each side. Mark the rib stock by laying the full-size pattern directly over the wood and scribing a pencil line along the edge of the pattern, Fig. 7. Allow at least $3\frac{1}{4}$ in. for the width of the rib. After marking the sheer, chine and all water lines on the rib stock, refer to the full-size plan view and measure the angles at the sheer and water lines with a bevel square as indicated at station 4, Fig. 4. Then, mark these angles at their respective water lines as shown in Fig. 6. When making the angle cut on a bandsaw, it is a good idea to have a helper, as in Fig. 5, because he can change the angle of the cut as marked at the various water lines while you guide the board.

Cut two sets of ribs for each frame, but be sure to reverse the angle cut so that the ribs can be assembled as pairs. If a tilting-table bandsaw is not available, you can cut the angle with a wood chisel or block plane after the rib is sawed. However, this method is much slower and not quite as accurate. Mark the line for the

second cut of the rib with a compass or marking gauge set at $3\frac{1}{4}$ in., as in Fig. 8. This cut need not be made at an angle. Leave the penciled water-line marks on the ribs as they are, but cut a small notch at the lead water line so that it can be located after the frame has been painted.

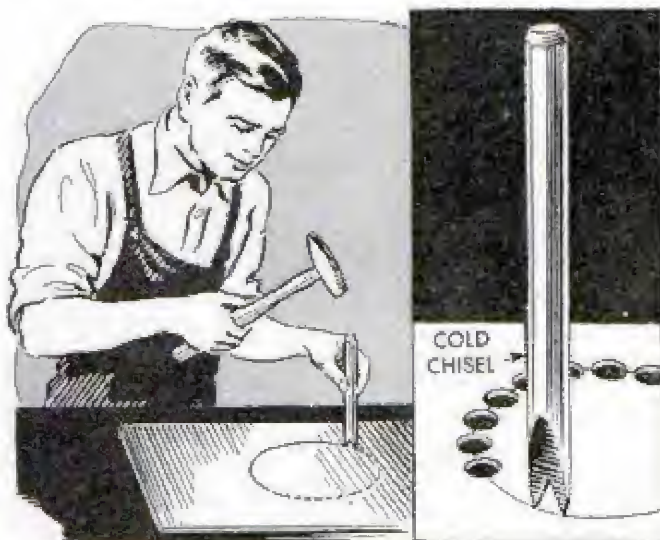
Assemble the frames either on a wooden floor or on two sheets of plywood fastened together. Draw a heavy line on the floor to serve as a centerline and line up the edge of the full-size pattern with it. Then place a bottom and side rib directly over the pattern to assure perfect alignment and temporarily nail a gusset to the ribs to hold them together. Pencil marks made on the floor along the outside edge of the ribs will help locate their position when the paper pattern is slid out and turned over to assemble the ribs for the other side of the frame. When both sides are assembled, carefully check the distances from centerline to sheer on each side and nail the temporary tie bar across at water line 6, as shown in Fig. 10. Then bolt the tie bar across the bottom with its lower edge flush with the notch for the keel apron. The tie bar is 4 in. wide and is made of the same material as the ribs. The gussets are also 1 in. thick and extend about 8 in. each way from the chine corner. The shape of their curve is not too important and may be drawn freehand.

The gussets are then bolted to the ribs. Before removing the frame from the floor, carefully mark the centerline on the temporary tie bar as indicated in Fig. 11.

(To be continued)

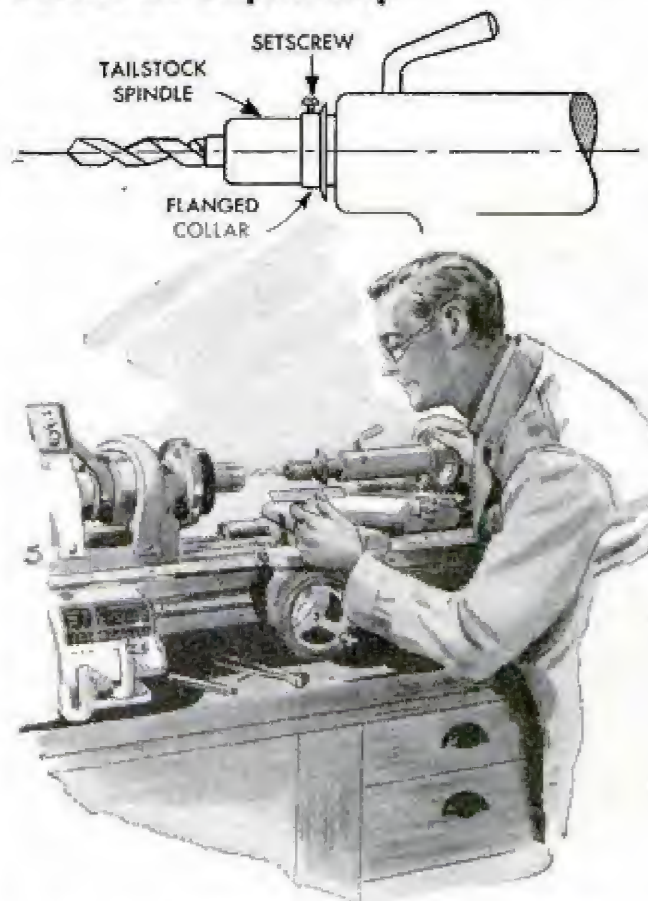
Double-Point Center Punch

It's a simple job to accurately center-punch a series of holes that are the same distance apart when you use this double-point punch. Make it from a cold chisel and grind a V-notch in the end to form points spaced to suit the distance you want holes apart.—C. Klumb, Rockfield, Wis.



MARCH 1948

Flanged Collar on Tailstock Spindle Serves as Depth Stop

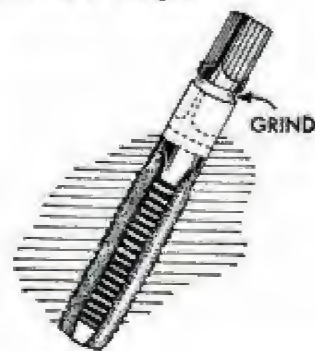


If your lathe is not equipped with a graduated scale on the tailstock spindle you can make a depth stop for drilling operations by merely placing a flanged collar, fitted with a setscrew, over the spindle as shown. To set the collar, first drill the work until the bit makes a full cut and then lock the collar against the end of the tailstock. As the drilling progresses, measure the distance between the flange and tailstock with a scale. This distance indicates the depth of the drill in the work.

Groove Reclaims Small Taps

To prevent a small tap, especially a bottoming-type tap from breaking at the body and therefore having to be discarded, grind a groove in the shank as shown. If too much stress is put on the tap, it will break, in most cases, at the groove rather than at the threaded part. When this happens, the tap can be reclaimed by grinding new wrench flats on the shank. If space permits, another groove may be ground and the tap reused a second time.

R. C. Roetger, New City, N. Y.



225

SICKLE-BAR LAWN MOWER

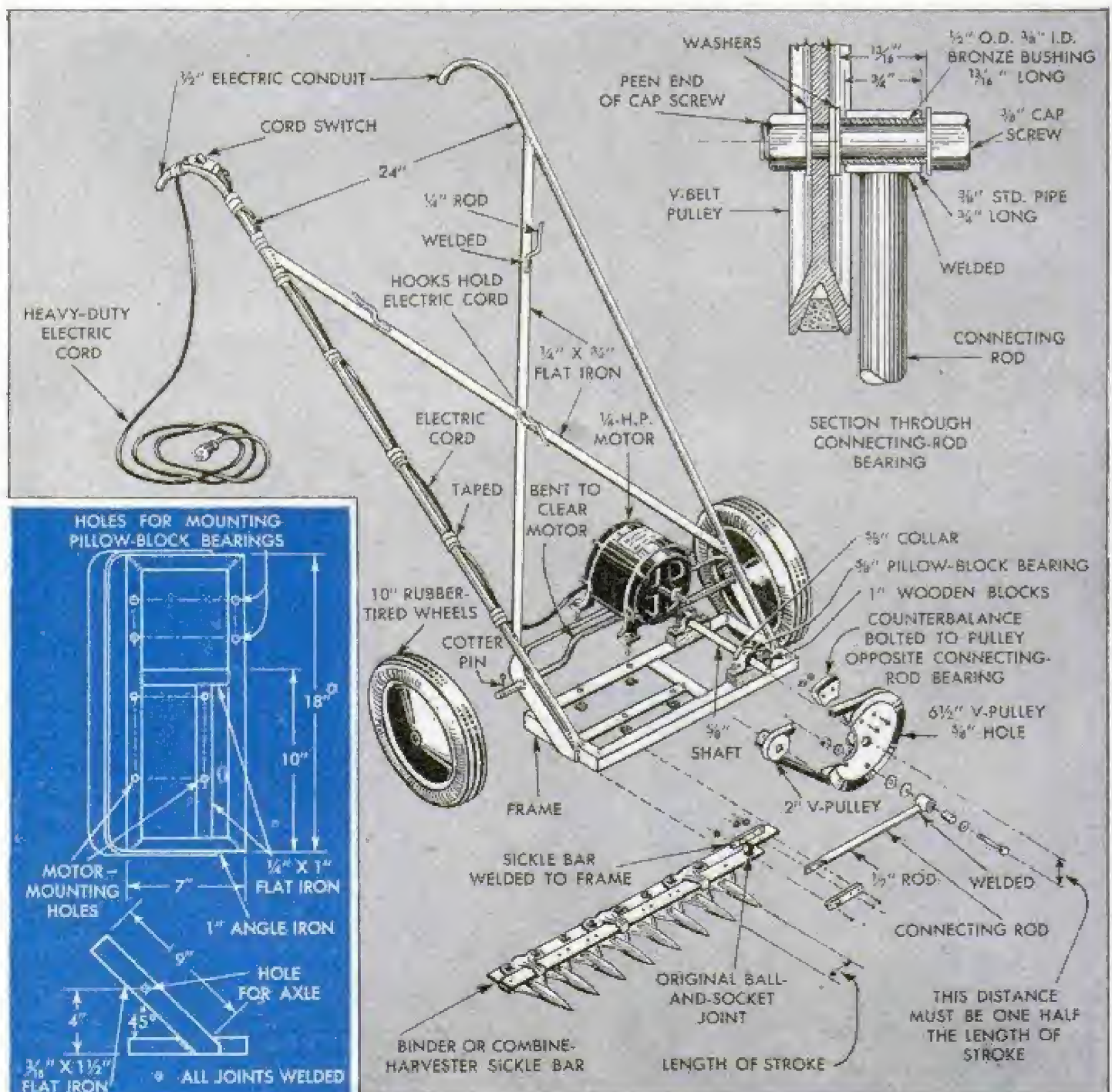
It operates like a farm mowing machine—cuts tall weeds and tough grass where a reel-type lawn mower won't work at all

THIS electric "scythe" will save a lot of time and hard work for farmers and homeowners alike. You can get it into places where the conventional lawn mower will not operate—under picket fences, around trees and under low-growing shrubs, along flower beds and rock walls. On vacant lots and large lawns, it will cut the troublesome tall-growing weeds and heavy bunch grass. Besides, it mows well

on the smooth lawn, for the sickle cuts as low as a regular lawn mower.

Only the sickle is power-driven. The parts of the mower are lightweight which makes it easy to push on reasonably level ground and easy to maneuver in close quarters. Construction is shown in the details below. Obtain 10-in. rubber-tired wheels of the semipneumatic type, a ¼-hp. motor and a 24-in. length of sickle bar from a grain binder or combine-harvester. This type of sickle bar is lighter and better suited to the purpose than the sickle from a conventional farm mower.

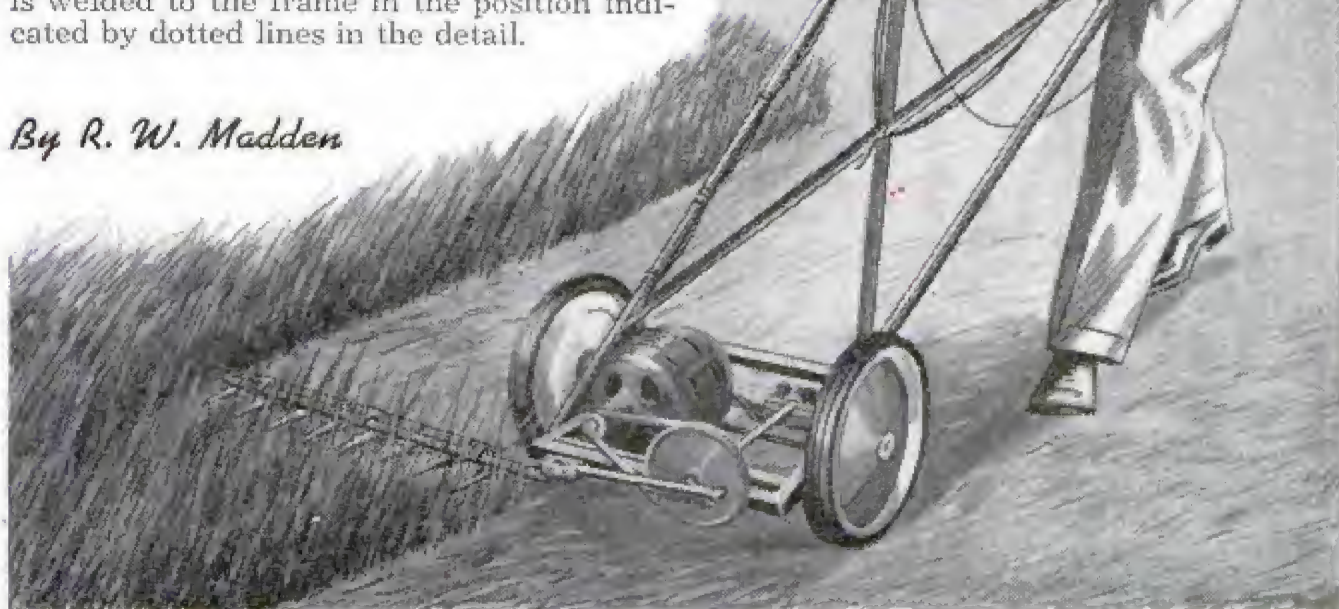
Notice in the detail that the angle-iron



Has Electric Drive

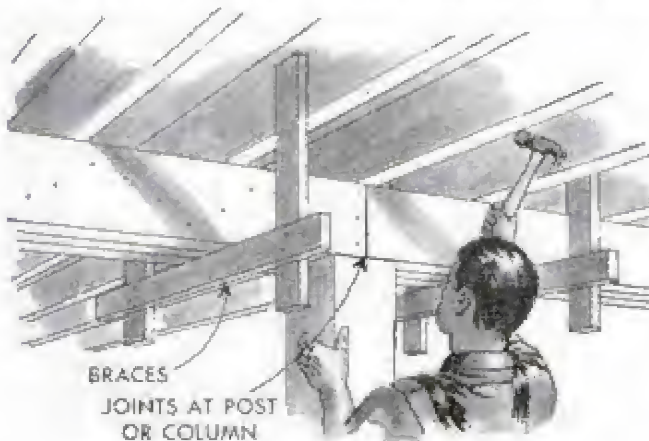
frame is underslung and is carried well forward of the axle so that weight of the motor and sickle overbalances the handles. The frame, which supports the motor and pitman drive unit, is welded to give one-piece rigidity. Additional pieces of flat iron are welded into the frame to provide a suitable base for the motor. Handles, bent from rigid electrical conduit or pipe of equal size, are X-braced with flat iron and are welded at the lower end to a U-shaped member. The latter is welded to the main frame at a 45-deg. angle as shown in the blueprint detail. The axle, welded in place last, is bent to clear the motor. Tape a heavy-duty electric cord to one handle and connect a feed-through switch for control of the motor. The connecting-rod bearing and the pitman assembly are clearly shown. The sickle bar is welded to the frame in the position indicated by dotted lines in the detail.

By R. W. Madden



U-Shaped Hangers Support Planks When Replacing Floor Beams

Much of the heavy work involved in replacing old floor beams can be eliminated if these simple wooden hangers are used to support the planks on edge as they are



installed. Spike the hangers to the joists to hold the top edge of the new beam slightly below the bottom edge of the joists to permit sliding the individual planks in place. Then apply floor jacks to the joists in the usual manner and raise the joists slightly to compensate for the amount the hangers are dropped. Erect two hangers for each post, placing one on each side. The planks are set in place, one by one, and then spiked together to form the beam. Lap them so that all joints of the entire beam are staggered. After setting the posts or columns in place, remove the jacks and temporary hangers. The same procedure may be used to install beams when putting a basement under a house.

Michael Ligocki, Gary, Ind.

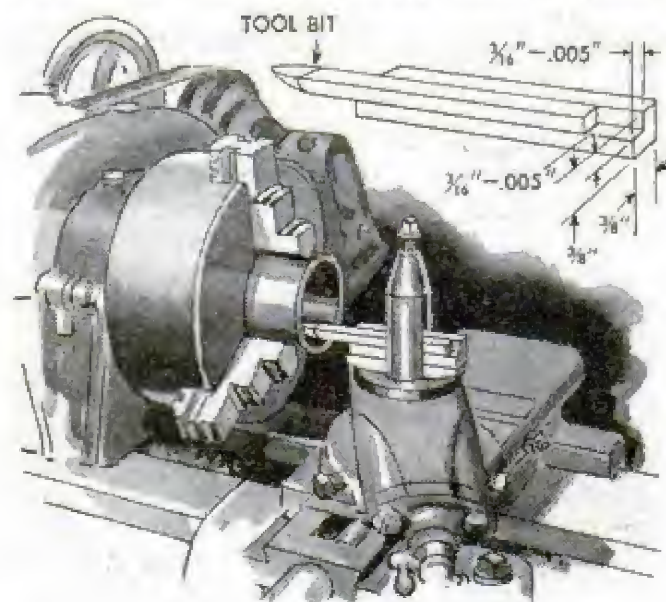
Fountain Brush to Clean Floors In Shops and Garages



You can save time and do a better job of cleaning concrete floors in shops, farms and garages by using a floor brush like this one. It is merely a regular floor-scrubbing brush which has a garden hose taped to the handle so that the nozzle directs water in front of the brush as it is pushed over the floor.

Rabbeted Clamping Block Supports Small Bits

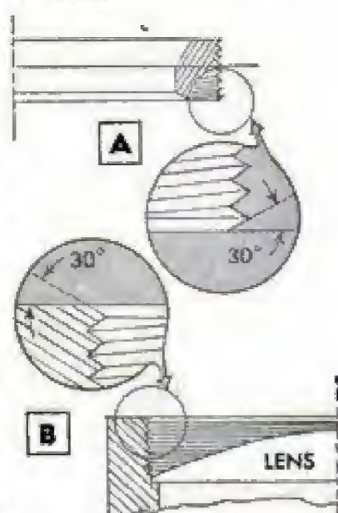
When a lathe job requires a tool bit of small cross section, this rabbeted clamping block will give rigid support to the bit when placed in the tool post. It is simply a piece of $\frac{3}{8}$ -in. cold-rolled steel, rabbeted along one edge to take the size of bit being used. Note that the depth of the rabbet should be machined about .005 in. under



actual measurement to assure positive clamping of the bit. With the bit supported in this manner, chattering will be reduced.—Joseph F. Grece, New York City.

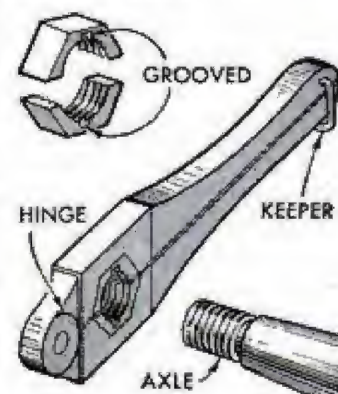
Chamfered Edges on Optical Parts Help Start Fine Threads

Threaded lens rings, screw-on metal lens shades on older-type cameras and similar optical and mechanical parts often become difficult to screw on due to a tendency to cross-thread. This becomes more and more troublesome as the thread wears at the starting end. One remedy is to cut a 30-deg. chamfer on the leading edge of the male fitting, detail A, and also on the internally threaded part, B. The chamfer positions the parts so that the threads will engage properly.



Die Improvised From Nut

If the threads on a bolt or axle become damaged or stripped to such an extent that the nut cannot be replaced, and a die of the proper size is not at hand, you can true up the threads with a duplicate nut. First, two grooves are filed on the inside of the nut as shown to form cutting lips, and then the nut is sawed in half at right angles to the grooves. The two parts of the nut are held in a special pliers-type holder, which is pivoted or hinged at one end to permit the nut to open and engage the end of the damaged threads, after which the handles of the holder are squeezed together and held with a keeper. While the original holder was machined from metal, a simplified one can be made of hardwood. Or, an adjustable end wrench may be used.



William P. Houser, Organ, N. Mex.

☛To store tubes of oil colors after use, spread a little petroleum jelly on the threads of the tubes before screwing on the caps. This will make the caps easy to remove when the colors are used again.



Foundation Units for Amateur Transmitters

WITH all of the troublesome "bugs" eliminated, these flexible time-saving units enable the amateur to assemble an efficient rack and panel transmitter in a comparatively short time. The r.f. power amplifier shown in photos A and B is a compact universal type designed for use with a pair of such tubes as T40s, TZ40s, T55s or type 812s. Only a slight change is necessary for altering the circuit for these, or other tubes of the builder's choice. Although this Millen r.f. amplifier stage comes wired for the 6.3-volt 812 tubes, it is a simple matter to change the filament transformer specification to 7.5 volts for any of the other popular tubes listed above. Ample room is left in the chassis to provide for mounting the filament transformer. The plate-circuit input is on the order of 500 watts.

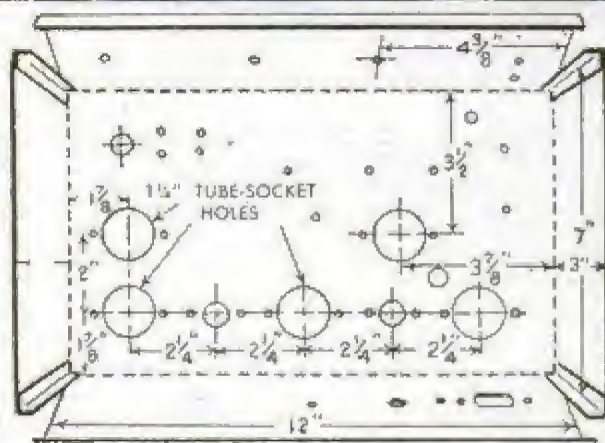
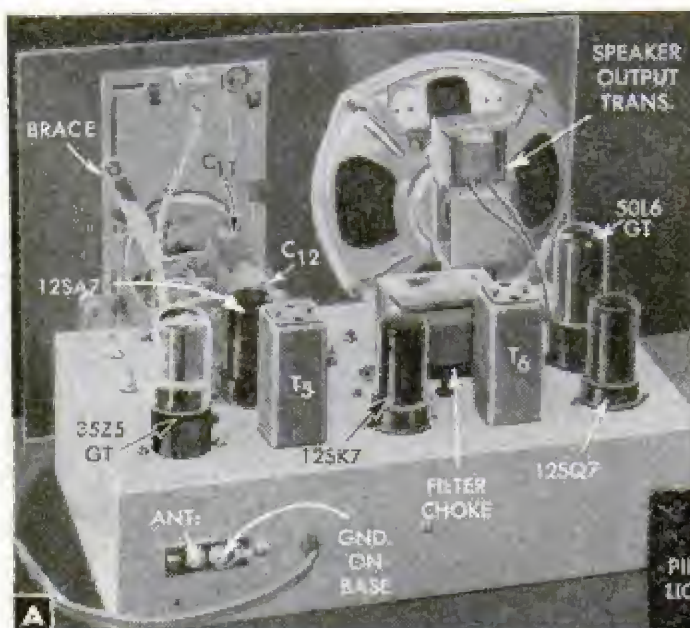
Individual plate and grid meters of 100 and 500-ma. range are mounted on the front panel as well as the grid and plate-circuit tuning controls. The unit is equipped with center-linked coils in the grid circuit, and coils for use with swinging link in the plate-tank circuit. Either 10, 20, 40 or 80-meter Millen coils may be used. A suitable high-voltage power supply can be found in the A.R.R.L. radio amateur's handbook. This r.f. amplifier unit may be used to increase the power of any small transmitter. However, it was designed to be driven with the exciter unit shown in photo C. This is a 50-watt exciter which employs a type 6L6 tube as the oscillator and 807 tube is in the output stage which feeds directly into the r.f. power amplifier. A tri-tet circuit is used in this exciter unit to obtain harmonic output at the crystal fundamental by short-circuiting the cathode tank circuit. Sufficient oscillator output at the fourth harmonic of the crystal frequency is obtained to drive the 807 tube, which may be operated as either a straight amplifier or frequency doubler, making it possible to obtain an output of from 25 to 50 watts in four bands from a single crystal of properly chosen frequency. A companion power-supply unit for this exciter is shown in photo D. It is also mounted on a standard 19-in. rack-type panel 10½ in. high. It uses two type 816 rectifier tubes and has a d.c. output of 700 volts at 250 ma., completely filtered. Final assembly is made in a relay rack.



1948 "LITTLE GIANT" TWO-BAND A.C.-D.C.

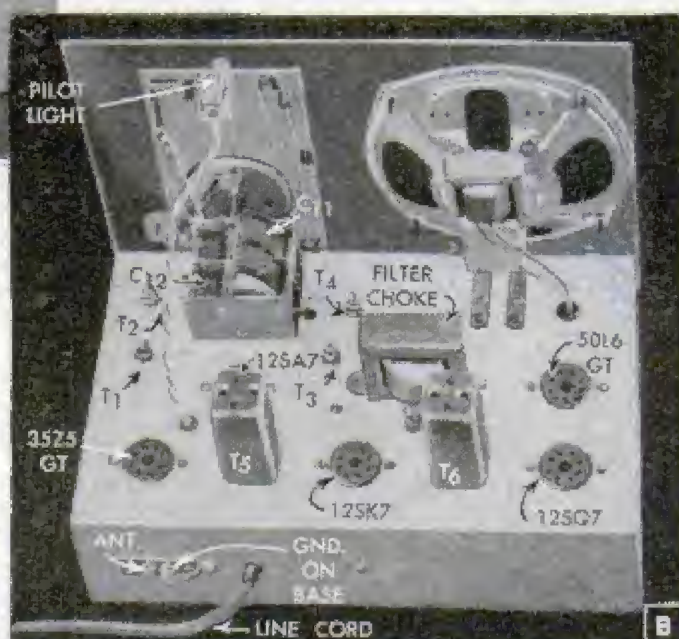
By L. M. Dezettel

OUTSTANDING two-band performance is the main feature of this new model of the popular "Little Giant" special student set that many readers of *Popular Mechanics* always look for in the March issue. It will reach out and bring in overseas short-wave programs on the 6 to 18-megacycle band, which is the favorite DX band that gives the best results during the evening hours on the North and South American continents. It also provides excellent stand-

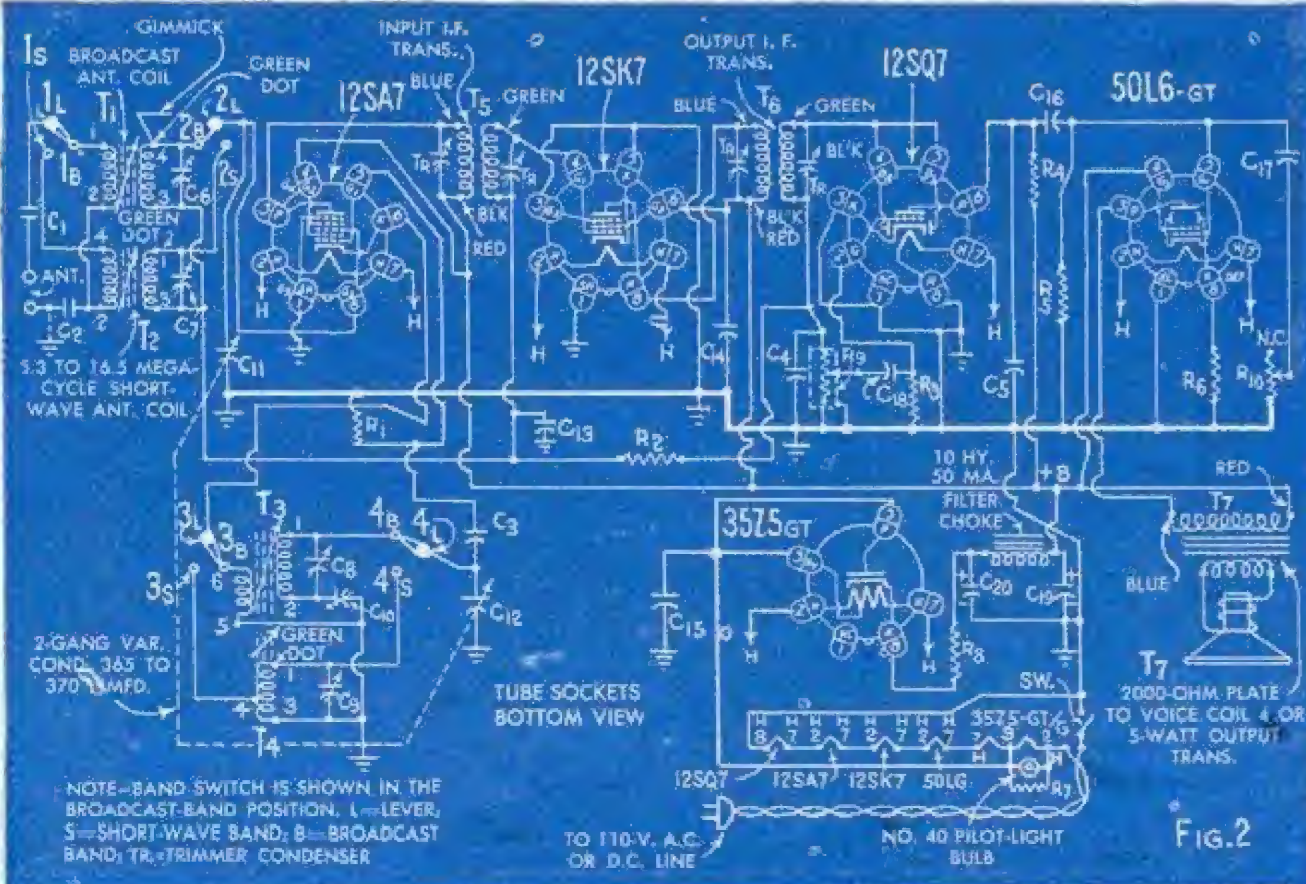


DETAIL OF METAL BASE

FIG. 1



B

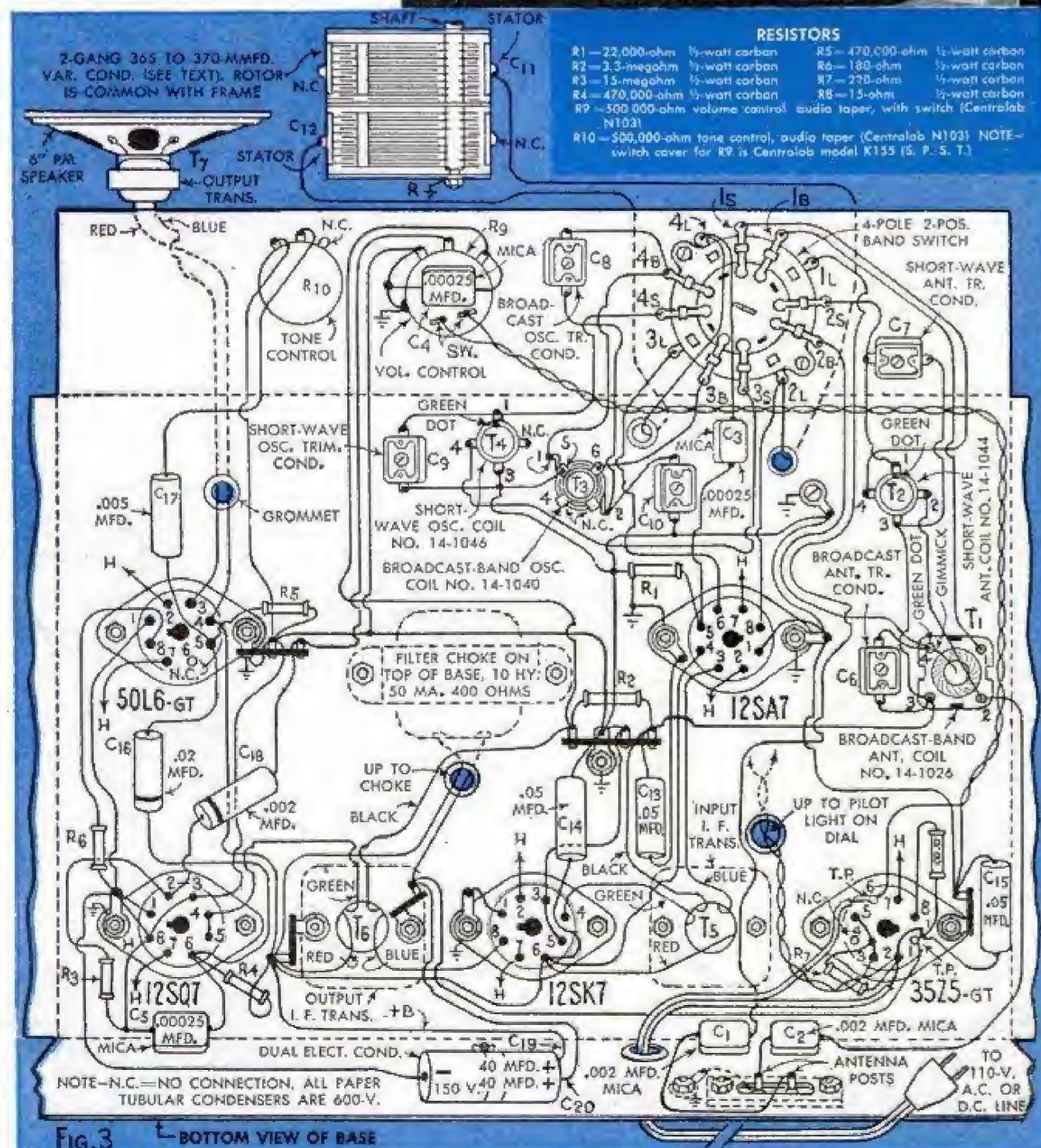
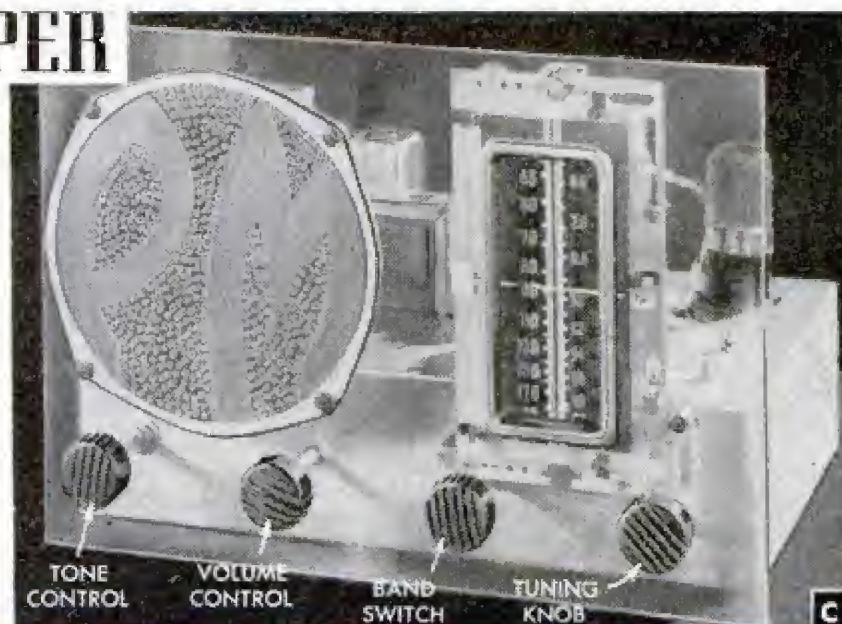


FIVE-TUBE SUPER

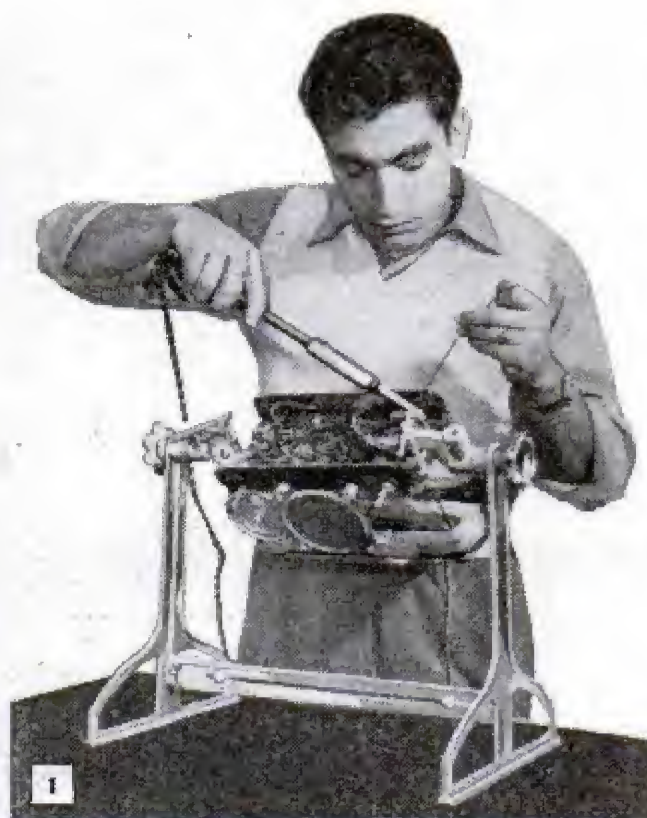
ard broadcast-band reception from below 550 to above 1700 kilocycles. Two-band operation is accomplished by means of a simple rotary-type, 4-pole, 2-position band switch that shifts from the broadcast coils to short-wave coils.

The circuit is of straight-forward type, and the tube filament voltages are such that, when they are connected in series, they add up to about the line-voltage value.

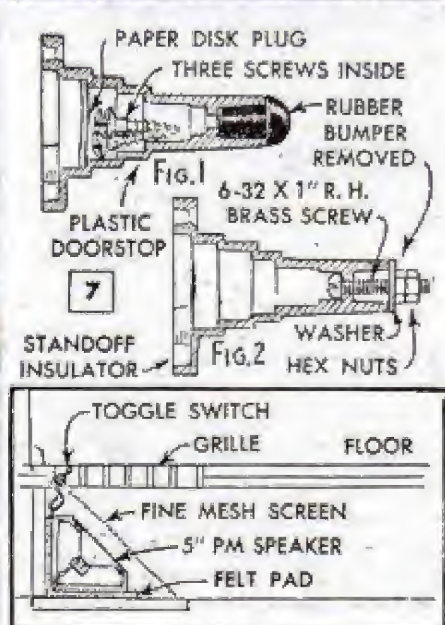
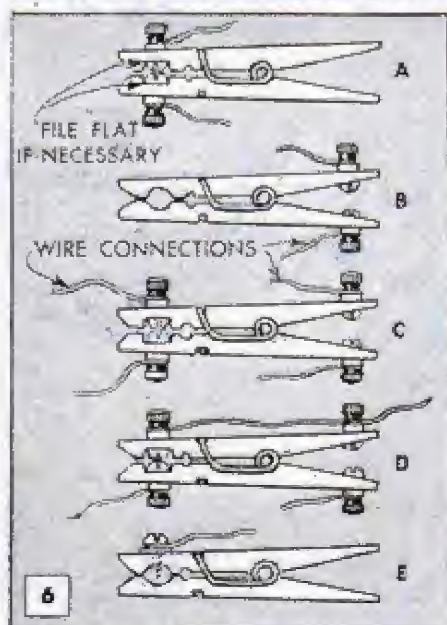
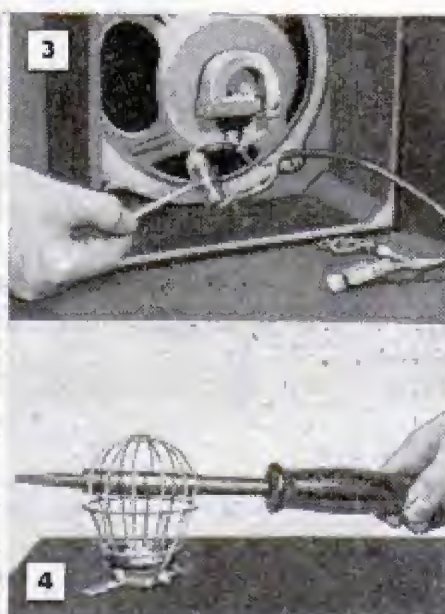
(Continued to page 234)



HELPFUL RADIO HINTS



1—All-purpose chassis holder for the workbench rotates any radio chassis or phonograph turntable through 360 degrees in a horizontal plane during the repair job. **2**—This handy steel rack keeps small radio parts in an orderly and convenient manner; it consists of 5 shelves with 30 clear glass screw-cap containers. **3**—To arrange a test speaker of the PM type permanently for connecting to the plate terminal of an output tube to check speaker systems, connect a .01 paper-type fixed condenser in series with the test speaker leads. **4**—Metal lamp guard fastened to the workbench with angle brackets provides a support for soldering iron. **5**—Section of bicycle inner tube over tube shield eliminates vibration troubles. **6**—Simple experimental switches and connecting clips made from snap clothespins. Fig. A shows closed-circuit type; B, open circuit, for temporary closing; C, open-close circuit; D, single-pole, double-throw switch; E, temporary connecting clip. Small insulated screw-cap binding posts and r. h. brass machine screws are used for contacts. **7**—Figs. 1 and 2 show a standoff insulator made from a dime-store plastic doorstop. **8**—Non-directional remote speaker system for the home. Speakers are mounted under ornamental floor grilles; the box-type baffle is insulated from the structure



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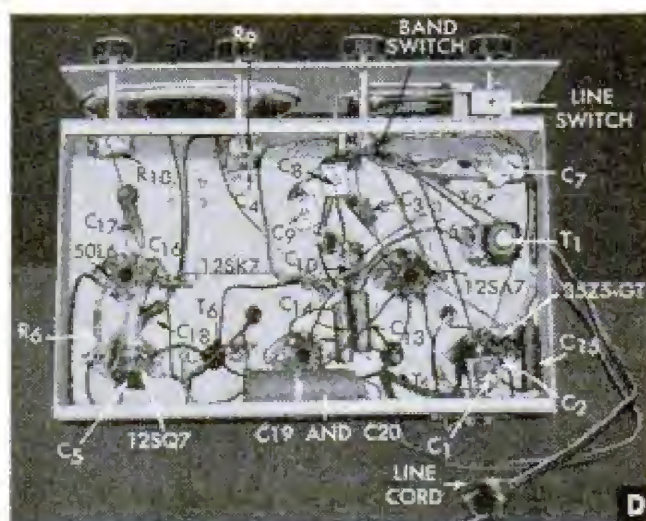
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(Continued from page 231)

No ballast tubes or dropping resistors are required. Automatic volume control (AVC) is included. The parts used are all



standard items made by reliable manufacturers and available from any of the larger parts houses; the chassis base, Fig. 1, is intentionally rather large to make wiring easy. A clear plastic panel was used in the model mainly for the purpose of showing how the parts are mounted on the top and front. Plywood or 1/8-in. hard-pressed wood may be substituted for the plastic; uncut ready-made cabinets are listed in parts-house catalogues.

A complete schematic circuit diagram is shown in Fig. 2. Every wiring detail is clearly indicated in the pictorial wiring diagram, Fig. 3. Trimmer condensers C6, C7, C8 and C9 are all 2 to 30-mmfd. ceramic compression types; C10 is a 100 to 580-mmfd. padder condenser of the same type. Coils T1, T2, T3 and T4, and the I. F. transformers are all Meissner types. The I. F. input transformer is a 456 kc. No. 16-6666; the I. F. output is a 456 kc. No. 16-6667. Coils T2 and T4 are both universal 5.3 to 16.5-megacycle variety. The 2-gang variable condenser (C11 and C12) may be any of the old type 365, or 370-mmfd. units. If the parts house supplies one of the new standard types which are 489.8 mmfd. per section, it is necessary to remove 3 plates from each rotor section. Instructions are furnished with the condenser for doing this. Follow the placement of parts as shown in photos A, B, C and D.

Underside photo E is a close-up view to show the coils clearly. These coils are of the adjustable iron-core type, and the adjusting screws are identified in the top view, photo B. The dial is a Crowe tuner, type 231, with a No. 36419 vertical 2-band

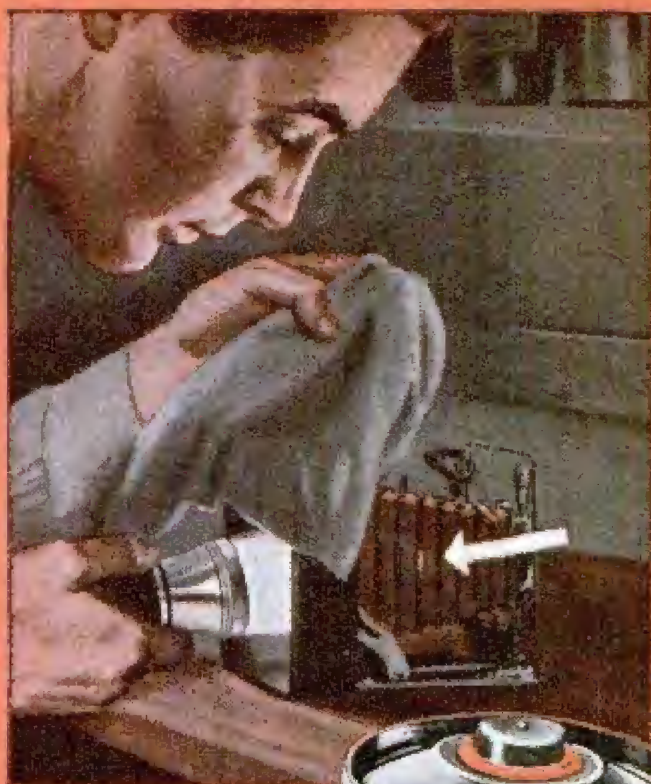
(Continued to page 236)



HOW TO KEEP *LIGHT STREAKS* OUT OF YOUR SNAPSHOTS

SO YOU did it again. You were so sure this was going to be the best "shot" yet! But, no... It's just another snapshot full of light streaks. That indicates there may be holes in the bellows of your camera. There's an easy way to find out. Use your trusty flashlight. Better be sure your flashlight is powered with "Eveready" batteries. Powerful, dependable, they outlast all other brands!*

GET OUT YOUR FLASHLIGHT. Take the back off your camera, as you do to put in new film. Then project the head of the flashlight just inside. The remaining exposed area of back should be covered with a cloth—the shutter should be closed. If you turn on the flashlight in a dark room, any holes in the bellows will be exposed immediately.




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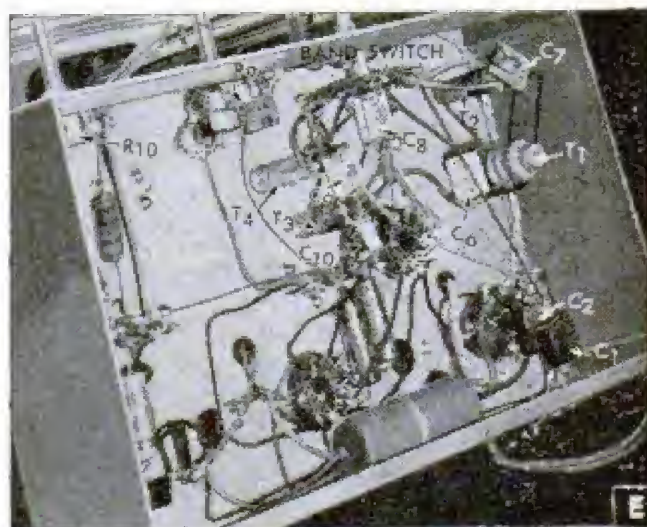
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scale. Resistors and condensers should be connected with the shortest possible leads. A piece of heavy hookup wire is used as the "common negative bus" which is also grounded to the chassis, thus reducing the possibility of interstage oscillation on short waves. Note that this also makes the internal wiring a part of the chassis circuit. Therefore, when making adjustments on the chassis outside of the cabinet, place the set on a wooden table away from radiators or other grounded metal objects. When placed in a cabinet this precaution is no longer necessary.

Do not connect an external ground wire directly to the chassis of this set. With the band switch in broadcast position, tune in a station and adjust each of the I. F. transformer trimmers in the tops of the cans



for maximum volume. Now tune the set to a station near the low-frequency end of the band and note the dial reading. If the actual station frequency and the dial reading do not agree, turn the tuning control back and forth, at the same time adjusting the C10 padder condenser on the broadcast oscillator coil T3 until the station frequency and the dial setting agree. Now tune to a station near the high-frequency

(Continued to page 240)

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JONES: Not necessarily. But I know this much—you can't change a poor tool into a good one just by putting a well-known name on it.

DEALER: Of course not. But don't forget that when a reliable manufacturer puts his advertised brand name on a tool—or

any other piece of hardware—it's got to be good.

JONES: How do you figure that?

DEALER: The manufacturer has a reputation to protect. Thousands of men *believe* in that brand name... *depend* on it... and he can't afford to let them down. It's the same way with me and my hardware store. I've got to keep my reputation for quality merchandise or I couldn't even stay in business.

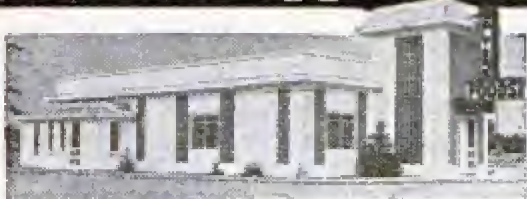
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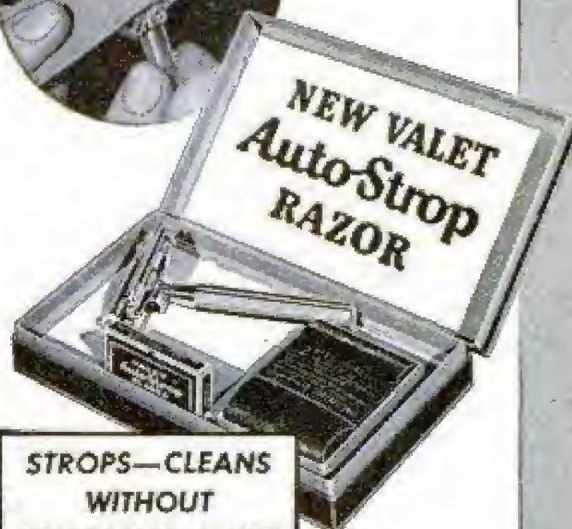
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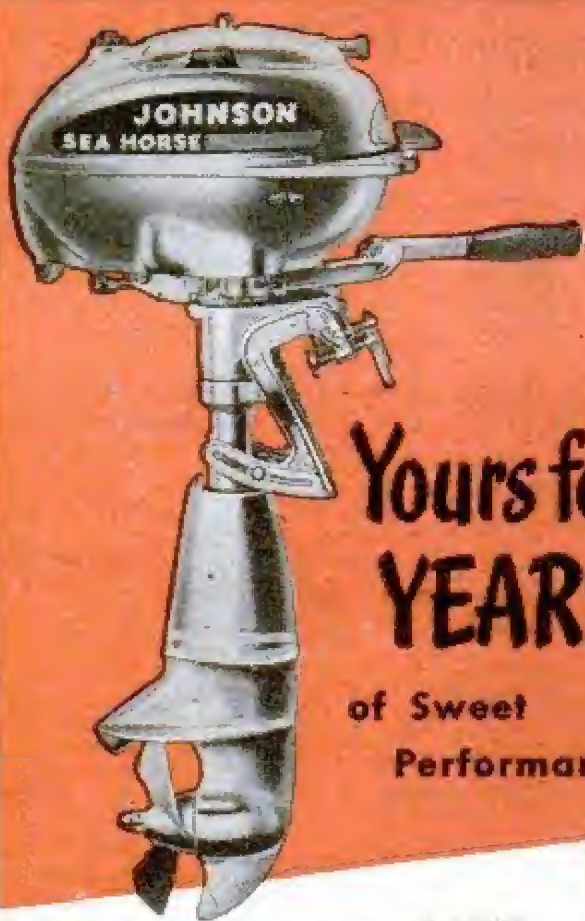
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end of the band and make the same adjustment using the C8 trimmer condenser. Again, tune to a station near the center of the band and repeat the operation, adjusting the oscillator-coil iron-core setting on T3 above the chassis. Each of the above operations will affect the setting of the others. Therefore, it may be necessary to go over each one again if precise tuning calibration is desired. The broadcast antenna coil T1 is peaked for loudest signal by tuning to a station at about 650 kc. and adjusting its core on top of the chassis. Then tune to a station at 1100 kc. and adjust trimmer C6. Aligning the short-wave band is done in exactly the same manner, except that coil T4 has no padder condenser. Adjustments are made at only two points on the dial, using the iron core and C9 trimmer condenser. It may take some time to identify stations and their frequencies on the short-wave band. A good starting point is to listen for WWV, the Bureau of Standards station at Washington, D. C. Their frequency is exactly 10 megacycles. Detailed student material list R-364 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

Hitchhiking Insects Forbidden

(Continued from page 173)

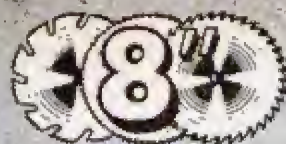
hours. Finally, the experts isolated this pest and wiped it out.

At present, the Department of Agriculture is making steady progress in its battle of the bugs. But entomologists are keeping their fingers crossed. They remember that 20 species of insects, six unknown in the United States, were carried here by the Graf Zeppelin in 1929. That was only one flight! Today international airports are in use all over the United States and increased traffic means more chances for destructive pests to sneak in.

Just a few of the new insects that have been discovered in cargo are the Latin-American fruit fly, found in the cabin of a transport; the pink bollworm, one of the world's worst cotton pests, discovered in cotton bolls from Egypt; the European cherry fruit fly, spotted in a cherry shipment from Portugal; the olive fruit fly from Italy; the West Indian sweet potato weevil from Puerto Rico; thrips, a destructive pest of carnations, on cut flowers from Greece; and the European pea weevil on fig marigold plants brought from Bermuda for propagation here.

Because of the tremendous increase in international air travel, the government

(Continued to page 246)



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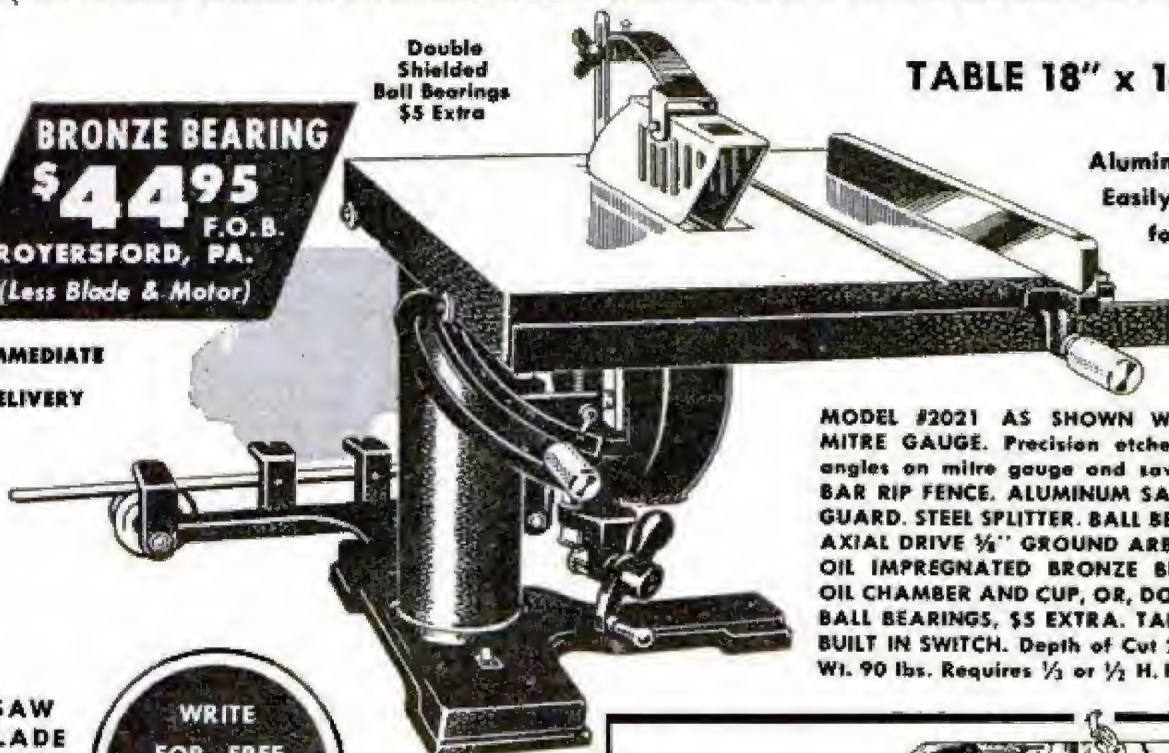
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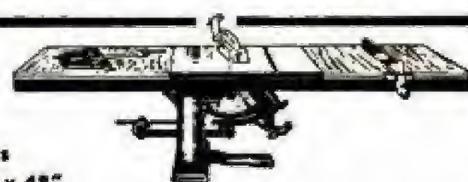
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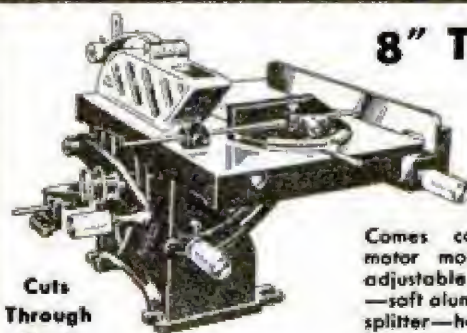
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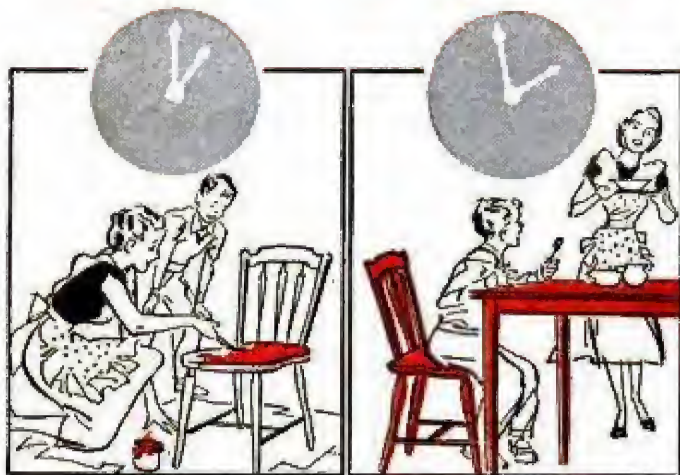
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Installing Basement Drain

Q—My home is in a low area, but my basement is dry the year around. There is no basement drain. A septic tank has been installed and connected to a large disposal field. Do you think it advisable to install a basement drain and connect it to the disposal system?

A. B.—Sandwich, Ill.

A—Under the conditions you outline we would say offhand that it would not be advisable. Without being on the grounds it is difficult to state positive reasons, but in general, much depends on the kind and nature of the soil in the drainage area, the length of the branch-tile runs in the disposal system and the direction of natural drainage in your locality. One method that has been used successfully under similar conditions is the installation of a separate drainage field for the basement drain, with local conditions determining the length of the main-tile run, the diameter and fall of the main tile, and the length, number and fall of the branch runs. Of course, in a poorly drained area this would involve a lot of labor and expense and even this installation would not entirely eliminate the danger of water backing through the tile into your basement during an exceptionally wet season.

Matching Wood Filler With Walnut Stain

Q—My living and dining rooms are trimmed with birch, stained walnut color. I tried filling nail holes with a wood putty, but it will not take the stain. What should I use?

A. C.—Toronto, Ont., Can.

A—Most wood-putty products are obtainable in colors, such as walnut, mahogany, etc. We suggest that you obtain the walnut color and test it for matching with the stain on your trim. If it is too dark, try one of the lighter colors, such as brown maple—not red maple—or light oak.

Removing Rust Stains From Asbestos Siding

Q—How do I remove rust stains from asbestos siding? The stains are under the windows and come from the screens.

R. G.—Elkhart, Ind.

A—It is difficult to remove rust stains from asbestos siding by any ordinary means without spreading the stain and damaging the siding. Many homeowners with this trouble have successfully used a masonry paint. This is obtainable in an off-white color and if you do a careful job of spraying the material, the rust spots can be covered effectively without the necessity of going over the whole wall.

(Continued to page 244)



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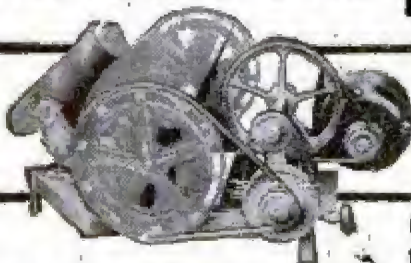
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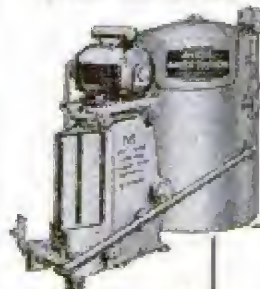
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Windows "Steam" and Drip Condensation

Q—What can I do to prevent windows steaming all over the house? The water runs down the inside of the glass and loosens the paint and enamel on both the sash frame and stool.

A. D.—Cincinnati, Ohio.

A—Probably the humidity in your home is too high. It would be well to check on this. But basically, the steaming is caused by moisture condensing on the glass because of the variation between inside and outside temperatures. At the present time, the cheapest and best remedy is installation of storm sash. The latter should be sealed with felt strips tacked or glued to the inside face of the stiles and rails. Sash should be fastened in place with metal turn buttons rather than hangers. If the storm sash is properly sealed as described, captive air between the inner and outer sash will tend to equalize the temperatures, thereby preventing condensation.

Waterproofing Basement

Q—During heavy rains water seeps through my basement wall, which is of concrete-block construction. Most of the water comes through just above the floor, through the first and second courses of blocks. How can I stop this?

C. W.—Wheaton, Ill.

A—Several products are now available for effectively waterproofing basement walls from the inside. If the wall is unpainted and in good condition—no cracked blocks or open joints—the job is almost as simple as applying a masonry paint. Follow the manufacturer's directions closely in preparing the material for application. In most cases, the waterproofer should be applied only when the wall is dry. If you work carefully you can do a good job with an ordinary whitewash brush. The important thing is to apply an even coat and to work the material well into the joints and the porous areas of the wall. If there are open joints, these should be cleaned out and repointed with regular mortar before applying the waterproofing solution.

Closing Open Joints in Linoleum Floor

Q—I recently laid linoleum squares over a soft-wood floor. The lengthwise joints have opened up. How can I repair the damage?

W. W.—Brownville Junction, Me.

A—Your description of the manner in which the joints of your linoleum floor have opened up suggests several possible causes. Moisture absorption by the floor boards, due to clothes drying in the basement, for example, could be the cause. Or, if in a new home, the boards under the opened joints might have had a higher moisture content when laid than those adjacent. This would cause slight warping in drying and might result in the opened joints in the linoleum floor. Another possibility is the presence of air pockets either under the felt base or between the linoleum and felt—one of the more common causes of trouble with floor squares. If any one of these possibilities is the cause of your trouble, then there is little you can do to remedy the fault except to re-lay the affected portion. However, rolling the floor with a heavy roller has, in some instances, helped to correct this trouble.

Water Seeps Into Brick Garage

Q—Water seeps through the brick wall of my garage at the back where earth is banked against it above the floor level. How can I prevent this seepage?

L. W.—Oklahoma City, Okla.

A—There will be considerable water pressure against the wall of the building. However, we believe it advisable to first try a masonry waterproofer, several of which are now supplied under various trade names, and commonly used in waterproofing basement walls. This can be applied to the wall inside the building when the wall is dry. This suggested remedy will not succeed, however, if the wall is cracked, or if the mortar has weakened and crumbled at any point. Only sound masonry walls will successfully take a waterproofer. Another method, involving more labor and expense, is the installation of a system of tile drainage, or the construction of a wall above the building at some point to divert the flow of surface water away from the garage.

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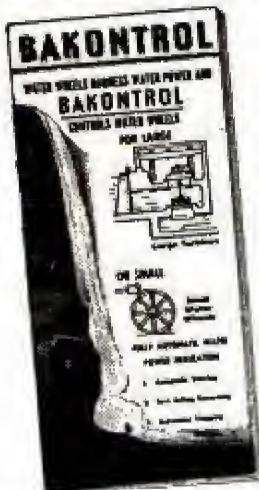
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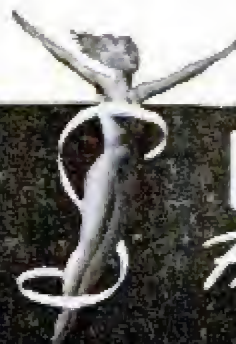
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At hobby, gift, hardware and department stores

X-acto Crescent Prod. Co., Inc., 440—4th Ave., N. Y. 16
In Canada: Handicraft Tools Ltd., Hermant Bldg., Toronto

officials are planning three lines of defense against insects instead of the single line now used. These are: (1) inspection of planes and cargo at the foreign airport before departure for this country; (2) continued inspection of incoming planes where the preflight inspection was not performed; and (3) an intensive program against pests that get through the first two lines and become established here.

The airplane has opened a new era in transportation for man and for insects. It affords a bridge over the world's water barriers for pests of the insect world. The problem is a serious one—much more serious than the disgusted lady on the Havana plane realized.

They Blaze the Trail into Space

(Continued from page 149)

tested wheeled into place directly below it. Built for much less money than the usual installation, the bell speeds up the Douglas test program.

Another unique chamber is the twin stratochamber used by AiResearch in which the conditions inside and outside a pressurized plane at high altitude may be duplicated simultaneously. One end of the chamber can be pumped out to simulate the pressure of 70,000 feet altitude while in the other end, separated by a strong partition, a pressure representing that of sea level or any intermediate altitude may be maintained. By operating their valves and switches, AiResearch engineers can duplicate the climb and dive characteristics of the fastest jet fighters and meanwhile check the functioning of pressurizing equipment installed in the partition between the two portions of the chamber.

Altitude chambers play an important part in research, but they can't duplicate actual proof-testing of equipment at high altitude itself. The final examination is to install equipment and carry it aloft for tests under actual operating conditions.

Members of the Boeing flight-test group have spent more than 1300 hours at altitudes above 25,000 feet collecting data on the performance of equipment under test. One B-29, "Noah's Arc," is credited with over 52 hours above 40,000 feet during 32 flights, believed to be more than any other airplane in the world. For each hour in the air, 650 man-hours of research is performed in laboratories and altitude chambers. Each 1000-foot jump in altitude is based on research that is often tedious and uncomfortable, and occasionally dangerous. But, as a result, military aircraft will soon be making routine flights at altitudes never before attained.

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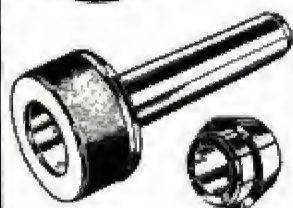
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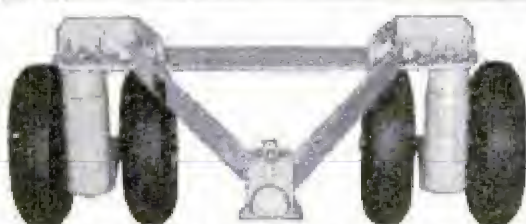
provides an accurate method for mount-
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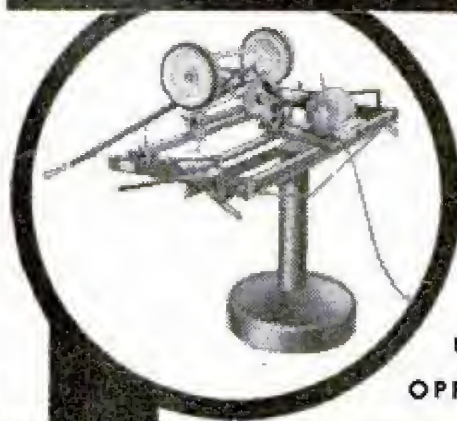
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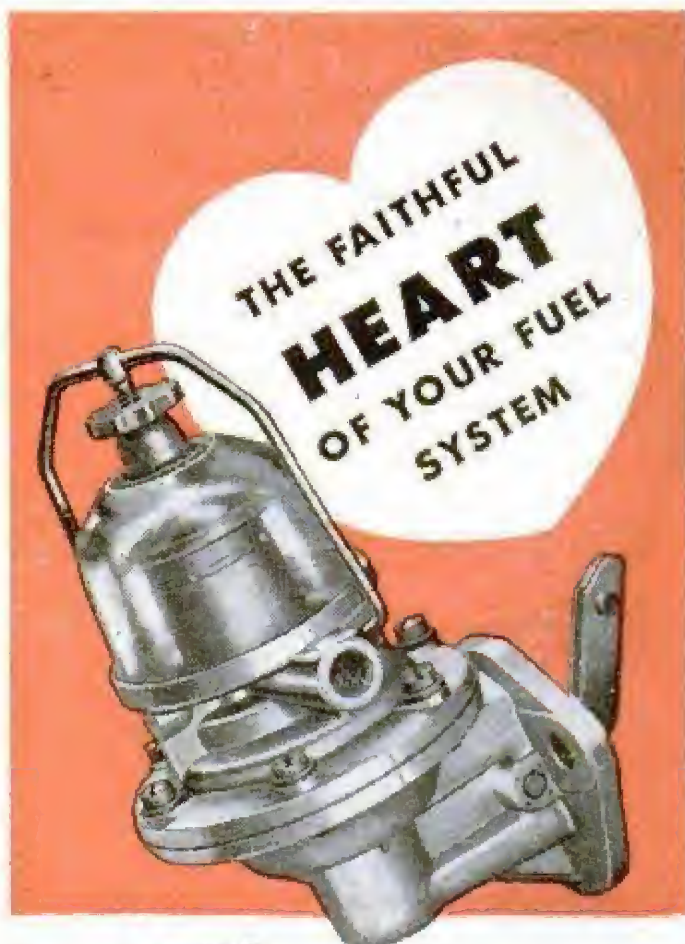
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AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

Tools That Fit in a Needle's Eye

(Continued from page 124)

glass slide and size them up under a microscope before putting them in an incubator.

At intervals of an hour or so while these cells are multiplying they are removed and slipped under the microscope again to see whether mutations are taking place in the newborn cells. When one is spotted that differs from its fellows, it is picked up with a minute pipette and put in a separate droplet where its descendants will be kept together.

If this isolated cell proves to be a sort of superman, it may be used to start a completely new culture which eventually can result in a loaf of bread of finer texture and higher nutritional value. If it's a weakling, it's doomed to an early death.

Micromanipulation in telephone laboratories helps make it certain that when you dial a phone you'll get the number you want. Few persons realize the complicated machinery they set in motion simply by taking down a receiver and turning a dial. To get the combination of numerals that represents the number you're calling, you may set to work as many as 5000 relay switches. Dr. Harold Wadlow, microchemist at Bell Telephone laboratories, points out that the deposit of foreign matter as small as a hundredth of a milligram—one three-millionth of an ounce—on the contact points of just a few of these switches can foul up transmissions.

"Usually the damage is done by films of corrosion and tarnish or by chemical changes that take place with aging equipment or which come about as an inherent result of the particular combination of materials used," he says.

He tells of a group of relay switches that had been gumming up connections because corrosion formed on their fine connecting wires. He put one of these wires under a microscope, and by manipulating a diminutive scalpel and needle he scraped off the foreign material, which weighed only a fraction of a milligram. This infinitesimal substance then was processed in equally tiny amounts of liquids through various tests until the mischief maker was found. It was a chloride deposit which, by corroding the copper wire, had prevented the flow of electric current. The chlorine salts were tracked down to their source and the trouble was eliminated.

"Likewise, micromanipulation often is the first step in paving the way for new designs that make for better service," says Dr. Wadlow. "When microanalysis shows that the tiny specks of rust or corrosion,

(Continued to page 252)

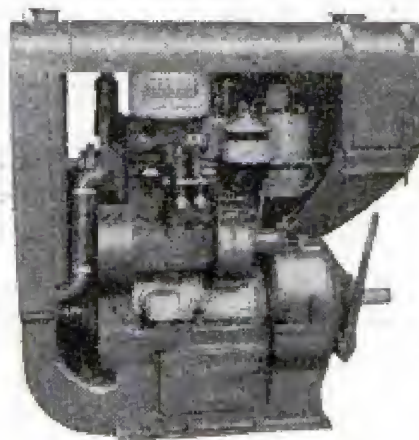
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WILL SOLVE YOUR POWER PROBLEMS?



AMAZING SMALL AIR-COOLED DIESEL—Sheppard Model 14—(left). At last—dependable Diesel power for garden tractors, sprayers, other moving equipment, home lighting plants, machine shops, compressors, pumps, saw mills, other small engine uses! 5.4 H.P. Available as power unit or 2,000 watt generator.



SHEPPARD POWER UNITS (left), 5.4 to 100 H.P. Thrifty, dependable Diesel power to drive portable, stationary and self-propelled equipment . . . compressors, pumps, shovels, mills, conveyors, saws, etc. Proved in thousands of war and peacetime installations, ashore and afloat, during past ten years.

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Fuel Economy: Sheppard Diesels cost only $\frac{1}{4}$ as much to operate as equal H.P. gasoline engines.

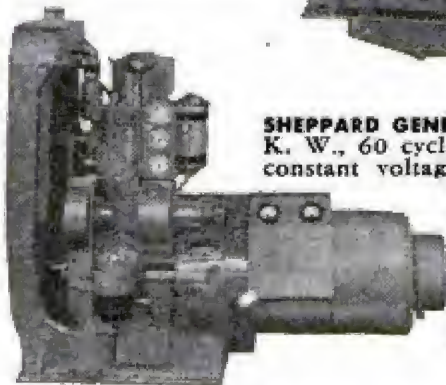
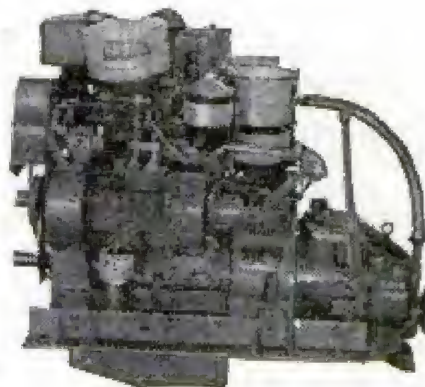
Diesel Dependability, Long Life: In tests have operated 3 to 5 times as long as equal H.P. gasoline engines without breakdowns or overhauls.

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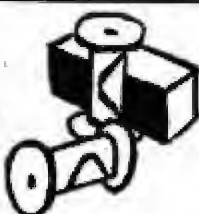
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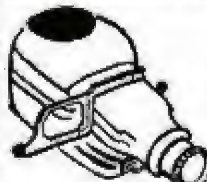
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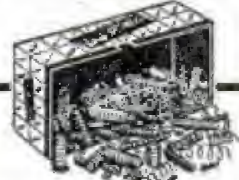


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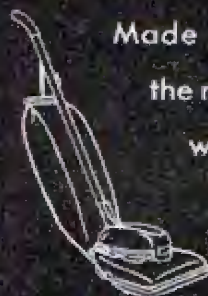
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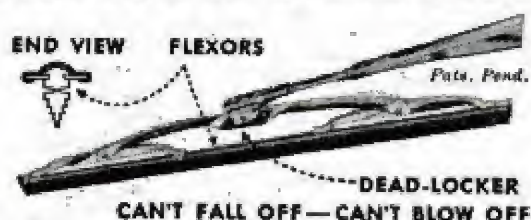
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which we manage to pry from faulty apparatus, are caused by exposure to the weather or to various operating conditions, our engineers devise new ways of protecting the parts from these ravages."

Pinning down the cause for failure of this intricate equipment, except through costly trial and error, would have been impossible only a few years ago because of the lack of tools small enough to obtain samples of the foreign particles doing the dirty work. Now micromanipulation is solving the riddles.

"Chessie" Has That New Look

(Continued from page 111)

There's no pounding on the rails in the 500. Instead of the heavy, counterbalanced drive wheels of the conventional steam engine, the 500 has 40-inch drivers that roll as smoothly as the wheels on your car. That means longer life for miles of expensive track.

By now the 500 is in open country and you look at the speedometer. The needle is hovering around 75 miles an hour. That's the speed limit here and the engineer takes his hand off the throttle. It's on the seventh notch. The engineer grins.

"Sure like to be able to pull it back to eleven!" he says.

Far down the track you can see a grade crossing. The engineer squeezes the whistle control. Faintly you hear the deep-throated whistle of the 500. At this speed the whistle behind you can hardly be heard inside the cab.

Ahead the lights of a town appear. The engineer pushes back the throttle and as the huge engine rolls quietly toward the station he applies the train brake. Smoothly, the train pulls down to a stop. With the locomotive standing still you hear plainly the hiss of the stoker jets and the clang-clang of the bell.

There's no puffing of smoke and no soot. The smoke problem has been solved by two turbine-driven fans that force air over the firebox when the locomotive is stopped or moving slowly. Air mixes with the coal gases causing almost complete combustion. The 500 is the first C & O main-line locomotive to use over-fire air.

Just now the 500 is breaking in at the unromantic task of hauling freight. But soon the 500 and two sister engines will pull the new luxury trains, the "Chessies." These ultramodern coach trains will make the Washington to Cincinnati daylight run in 11 hours and 45 minutes. Included in the "Chessie" will be a special

(Continued to page 256)



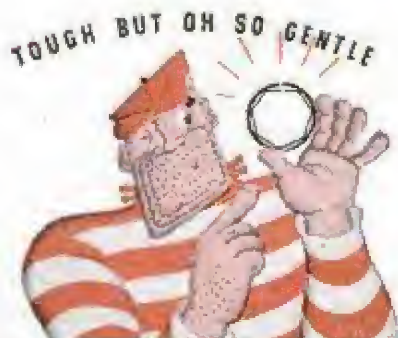
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wear out, too!

...and Oil Pumping is the First Symptom

It's possible to ignore oil pumping for a while, and to continue buying and wasting oil. But this kind of neglect is bound to cost *real* money later because oil pumping and engine wear go hand in hand.

Destructive engine wear is not far off when oil pumping starts.

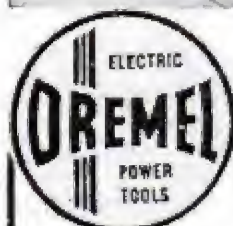
By installing Hastings Steel-Vent Piston Rings promptly you can *check* this engine wear, *stop* oil pumping and *restore* performance. It's the best money you can spend on your car. Hastings Manufacturing Co., Hastings, Michigan. Hastings Ltd., Toronto.



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Thread Length	7/32	7/32	3/32
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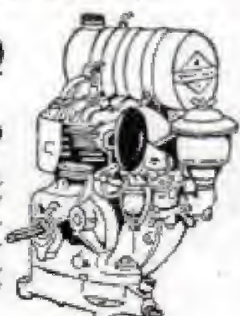
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Engines will develop almost 2 Hp. at 3600 RPM. Hurry don't wait. buy now while limited supply lasts. Suitable for lawn mowers, garden tractors, motor bicycles and scooters, midget cars, etc. Will power many kinds of machinery.



Write for Descriptive Circular

MIDWEST SURPLUS SALES CO. 1520 LOCUST ST. KANSAS CITY, MO.

WOODWORKERS . . . Get this

CONSTANTINE MASTER MANUAL

Get the Most Fun From Your Hobby Indispensable to woodworkers. Newest, biggest edition, more pages, more color, helpful how-to-do-it articles, pre-war and new items, more bargains. Send 25c today and we will include **FREE! FULL YRS. SUBSCRIPTION** to Chips and Chats, published bi-monthly. Keeps you up-to-date on everything in woodworking, offers big money-saving bargains. Send now.

ALBERT CONSTANTINE & SON, Inc. 791-P 135th Street, New York 54, N. Y.



... Quick Easy Way to BIG PROFITS

Read What Others Are DOING!

"Enclosed you will find 56 orders representing 9 1/2 hours' work on Monday and Tuesday."
"Enclosed are twelve orders secured after supper this p.m."

Housewives are Enthusiastic

Everyone that sees this outstanding Cell-U-Mop immediately wants one . . . That's the reason why our distributors are so successful . . . You also have the advantage of our other **QUICK SELLING PRODUCTS** that step up your Volume Sales and Profits.

• We Teach You How •

Gets down under and around for **MOPPING, DUSTING or WASHING**

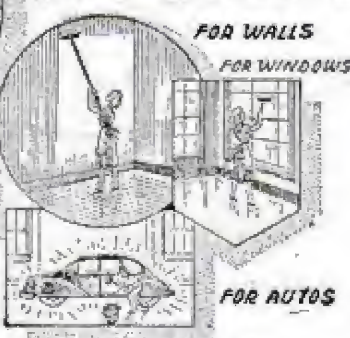
DOES THE WORK OF 6 TOOLS IN 1

Get Choice Territory **NOW!**

Holds 20 times its weight in water.



Hands Never Touch the Water—Can be put in Boiling Water. Housewives Like It.



48" Long Handle

Sales QUICK, EASY Every Locality

SALES ARE EVERYWHERE . . Sells quick to Taverns, Clubs, Hotels, Hospitals, Stores, Restaurants, Large and Small Buildings and the Homes . . Scores can be sold on a single street . . Note the Drain Bracket in the illustration . . This squeezes out the water so thoroughly that **HANDS NEVER TOUCH THE WATER** . . Makes no difference what you ever sold, you will like this proposition . . Your name on a Post Card will bring you **FREE PARTICULARS**.

CELL-U-MOP CO., Dept. P-3 FREEPORT, Ill.

Dependable

CHAMPION

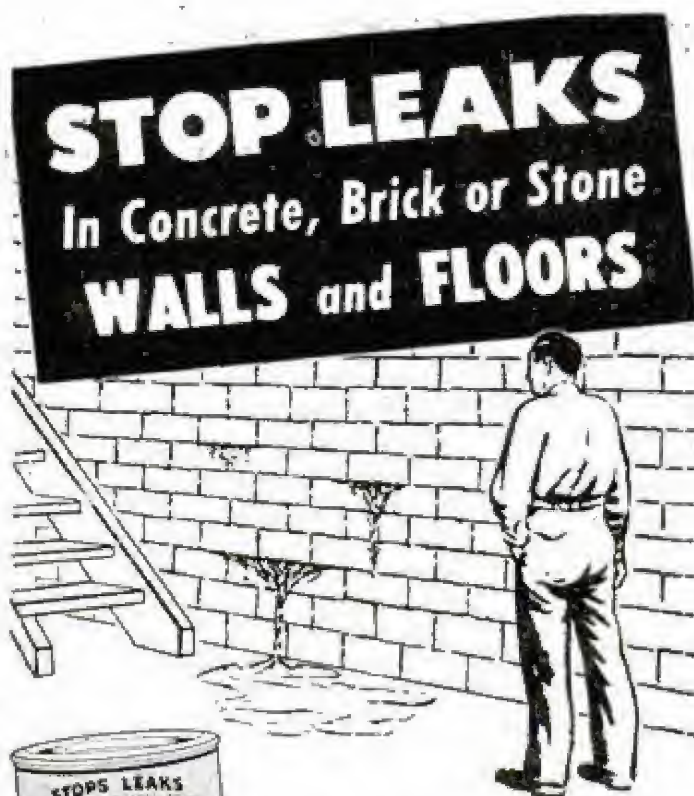
America's Favorite Spark Plug



Your choice of Champion Spark Plugs for your car is made easy and sure by the fact that Champion has consistently been America's favorite spark plug, and is backed by performance records unequalled by any other. Champion Spark Plug Company, Toledo 1, Ohio.

FOLLOW THE EXPERTS—DEMAND NEW DEPENDABLE CHAMPIONS FOR YOUR CAR

Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network



Apply Smooth-On No. 7 Iron Cement to cracks, holes, seams and porous spots, using a trowel or stiff brush. The surface to which you apply it may be either wet or dry. In

about 24 hours the Smooth-On will have set hard, sealing the leaks. It will stay in place, because it expands slightly as it sets.

Use Smooth-On No. 7 also to line cisterns, swimming pools, troughs, fountains, septic tanks, etc. Use it to seal openings where piping passes through walls.

Buy Smooth-On No. 7 in 1-, 5-, 25-lb. or larger size at your hardware store; if they haven't it, write us.

FREE REPAIR HANDBOOK

40 pages, 170 illustrations. Clear, simple directions for stopping leaks, sealing cracks, tightening loose parts in household equipment and autos. Every home needs this useful repair guide. Just mail the coupon for YOUR free copy.



-----Sign and Send NOW-----

SMOOTH-ON MFG. CO., Dept. 37C,
570 Communipaw Ave., Jersey City 4, N. J.

Please send me a Smooth-On Handbook.

Name _____

Address _____

3-48 _____

Do it with **SMOOTH-ON**
NO. 7 IRON CEMENT

kindergarten coach under the direction of a nurse so that mothers can relax during the trip. There'll be movies on board, individual radios in every seat, news bulletins will be flashed on moving ribbons of lights at four places on the train. Telephone calls will be received en route. A lighted map will show the train's location at all times. A tavern car will provide snacks at all hours and a new dining system will eliminate waiting in line for meals. If your taste runs to reading, there will be books and magazines in a library.

The coal-burning, turbo-electric 500s have accepted the challenge of the oil-burning Diesels and no matter which wins, the result will be better railroads and increased service for their passengers.

Weekend 49ers

(Continued from page 167)

beds and the beds of navigable rivers, areas below high tide, and certain other lands including the sites of proposed reservoirs. This still leaves hundreds of thousands of square miles of territory, especially in the region from the Rockies to the Pacific, open for exploration.

There are two kinds of mining claims. A lode claim covers a vein of ore such as quartz and a placer claim covers all other types of mineral deposits including gold-bearing earth or ceramic clay.

A lode claim may not exceed 1500 feet in length along the vein nor more than 300 feet on each side of the middle of the vein. Placer claims may be up to 160 acres in extent, with eight persons named as locators. Boundaries of a claim must be marked either by sturdy 4-foot posts or by stone monuments 3 feet high at each corner. For lode claims similar markers are erected at the middle of each end boundary in addition to the corner posts.

Likewise a discovery monument is placed at the point where the discovery was made. Attached to this monument is the notice of location consisting of a written statement that includes the date, name of the locator, name given to the claim, a description of the claim including the number of feet claimed each way from the point of discovery (placer claims may be designated by acreage), and the distance and direction from the point of discovery to permanent landmarks. The notice needs no witnesses. It is left at the point of discovery, protected in a bottle or can.

A copy of this location notice must be filed with the county recorder within a time period that varies with the different

(Continued to page 260)

MAGNETIC JIG SAW READY!

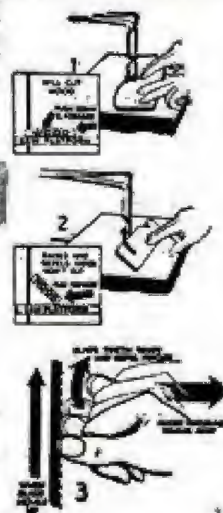
**NO MOTOR NEEDED... JUST PLUG IN
PORTABLE... SAFE... CUTS CLEAN, SMOOTH!**

CRAFTSMEN! PARENTS! Get SYNCRO... the remarkable, safe, patented magnetic jig saw... ready for immediate shipment! Use for fun or money making! SYNCRO needs no belt, no gears, no oiling. No rotating motor to buy. Just plug in any 50 or 60 cycle (A.C. only) 110-120 volt wall outlet—in kitchen, attic, basement—set on kitchen table, floor, anywhere—and saw! The high-speed, short Magnetic Safety Stroke Action, and freedom from belts makes SYNCRO so safe small boys and girls may use it. Cuts intricate designs on $\frac{3}{8}$ " soft wood, $\frac{1}{2}$ " medium hard plywood and thinner hardwoods, plastics, thin metals. Leaves no ragged undersides on plywood, cardboard. Cuts to center of 27" circle! SYNCRO is the biggest, most powerful, safest—and has the greatest clearance ($13\frac{1}{2}$ ") and largest table top ($10" \times 10"$)—of any magnetic jig saw made! Base, $7\frac{1}{2} \times 6\frac{3}{4}"$. Get, enjoy this safe, educational, practical quality tool for making models, displays, puzzles, inlays, silhouettes, toys, whatnots, etc. Limited supply—so hurry!



WHY SYNCRO SAWS ARE SAFEST

SYNCRO has no continuous cutting blade nor 'Long Stroke' blade to pull fingers into teeth—instead there are 14,400 strokes per minute—7,200 short cutting strokes plus 7,200 upward NON-CUTTING, REPELLING strokes! (Fig. 1) SYNCRO will not even CUT wood unless piece is pushed FIRMLY DOWNWARD AGAINST blade and FIRMLY FORWARD—both actions at SAME time! SYNCRO blade teeth cut ONLY on DOWN stroke. (Fig. 2) Teeth raise, repel, push away any object on UP stroke. (Fig. 3) When blade moves UP it KICKS finger away free. On down stroke, blade does not move far enough to accidentally cut finger unless finger is intentionally, deliberately fed into blade like wood is fed in Figure 1. No wonder SYNCRO is the world's SAFEST saw... a feature old and young users acclaim!



Complete
With Cord,
3 Blades

See Your Dealer First

SYNCRO

SAW CORPORATION, Dept. A-38
ROCHESTER, MICHIGAN
Export address: 120 Wall St.,
New York City

Gentlemen: Here's my order for one SYNCRO MAGNETIC JIG SAW, Model 2000, Shpg. wt. packed, 18 lbs. \$17.50 FOB Factory. Please send it complete with electric cable and plug. 3 blades, on your 10 Days Money Back Trial Offer.

I enclose \$17.50 as payment. Please ship saw:

☐ Express charges collect or ☐ Parcel Post charges collect.

☐ Express, for which I enclose an extra \$_____

☐ Parcel Post, for which I enclose an extra \$_____

Name _____

St. and No. _____

City _____

☐ I enclose no money—send FREE SYNCRO Circular.

No. 2000

SYNCRO

DELUXE JIG SAW

For Hobbyists, Craftsmen
and Light Production

ONLY
\$17.50

Priced
higher in foreign
countries

Shpg.
Wt. 18 lbs.

15 SYNCRO FEATURES

World's safest saw. Portable. No rotating motor needed as self-contained magnetic power unit transmits A.C. magnetic impulses to armature-diaphragm-power transferred to blade. No rotating parts to wear out. 14,400 magnetic strokes per minute. Never needs oiling. Large $10" \times 10"$ table top. Cross section engraved lines on top. Big $13\frac{1}{2}"$ throat clearance. Finest steel blades. Rubber feet. 5' cable, plug. Varying voltage adjustment unit. Lifetime, durability. Quality materials, workmanship, performance.

ORDER NOW ON 10 DAY TRIAL

Order with complete confidence on this liberal Trial Offer. When you get your SYNCRO, plug it in and saw, as per directions. Then, if it does not saw cleaner, better than any other jig saw you ever used, and with more safety...

if it does not satisfy YOU... return it undamaged, postpaid and post-marked within 10 days of its delivery date... and we will refund the saw price promptly without question!

SYNCRO SAW CORPORATION

DEPT. A-38

ROCHESTER, MICHIGAN

Export Address: 120 Wall St., New York City

WORLD'S LARGEST MAKERS OF ELECTRIC JIG SAWS

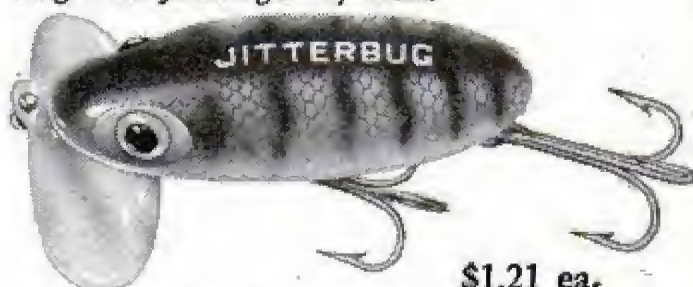


"Best Results with Jitterbug"

"Fred Arbogast Co.: Your Jitterbugs caught these bass at Indian Lake, New York. They weighed 6¾ lbs., 6, 5¼ and 4 lbs. each. We use many of your baits but have best results with the Jitterbug." Fred & Bill Tripton, Maybrook, New York.

Fascinating Action!

Jitterbug's exciting surface action fascinates fish and fishermen. Bass strike it furiously. And the action is right on the surface where you can see, hear and feel it. These noisy wobblers take bass day or night. Many northern pike and occasionally muskies are caught on Jitterbugs. Try them.



\$1.21 ea.

Choice of 6 colors. At your dealers.

Send for Free Catalog

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1623 North St., Akron, O.

"My motor never ran smoother!"



... say thousands of expert craftsmen who choose FIEND OIL, THE lubricant for light motors!

AT YOUR HARDWARE & SPORTING GOODS STORE

McCambridge & McCambridge
BALTIMORE, MARYLAND

BRAND NEW Solid Brass 7 ft. Portable

RADIO ANTENNAS

Real \$12 Value Now Only \$3.45 Postpaid
FOR HOMES, BOATS or AUTOS

JUST OUT! Gov't surplus used on Army tanks. These telescopic rustproof antenna have tremendous pickup eliminate dangerous wiring. Solid Brass throughout practically insuring NOISE FREE RECEPTION.

Exceptionally Rugged Sections compress into 1 ft. 2 in. Handy for Camping Trips, also Useful for Transmitting, FM & Television sets.

Each antenna comes securely packed with mounting bracket. Easy to install anywhere.

QUANTITY LIMITED

ORDER TODAY. A real \$12 value for only \$3.45 Postpaid. Mail check or money order now or sent C.O.D. plus postage. Money back in 10 days if not satisfied.

RADIO HOSPITAL 442 East 86th St., Dept. A15
NEW YORK 28, N. Y.

KINKADE GARDEN TRACTOR

and Power Lawnmower

A Practical Power Plow and Cultivator for Gardeners, Suburbanites, Florists, Truckers, Nurserymen, Fruit Growers.

Easy Terms - Write Today

American Farm Machine Co.
1058 33rd Ave. S. E. Minneapolis, Minn.



Catalog Free



WRITE FOR YOUR FREE COPY OF THE NEW KRW HYDRAULIC PRESS BOOK

Describes all manner of Production and Shop Work on KRW Hydraulic and Bench Type Arbor Presses. 32 pages illustrating the new KRW Hand-operated, Electric-operated and Air-operated Hydraulic Presses.

Write for your copy today.



K. R. WILSON, DEPT. 17, 215 MAIN ST., BUFFALO 3, N. Y.

Builders of Shop Equipment for Ford Dealers Since 1916

GENERAL ELECTRIC
BC 645
TRANSCEIVER

TWO-WAY COMMUNICATION

For EVERYBODY !!

10 times as
powerful
as a
walkie
talkie



\$14.95 for \$27.

A brand new two-way communication set which cost the Army over \$400.00 and is ideal for two way communication between house and cars, office, service trucks, ambulances, boats, etc. Range up to 15 miles in the 450 to 500 Mega-cycle band. Operates in the new citizens band. Supplied complete with 15 tubes and conversion instructions to operate from 110 V A.C. Add postage for 25 pounds.

ACCESSORIES NEEDED

PE101C Dynamotor for 12 or 24 Volt storage battery operation\$3.95
110 V A.C. Power Supply to operate BC 645 from house current\$11.95
T-32 Table Microphone.....\$2.95
Microphone Transformer.....\$1.00
5" PM Speaker for BC 645 \$2.80

GN58 GENERATOR

Makes excellent home lighting plant, operated by wind propeller, water-fall, gas engine, or hand crank. Reduction gear allows full output at slow speed; supplies 6 volts at 2.45 amp., 425 volts at .115 amp. New. Add postage for 28 lbs.**\$7.95**



DYNAMOTORS



\$1.95

\$5.95

\$5.95

An electric motor operating a generator on same shaft—hundreds of uses—gives high voltage from storage battery.

Dynamotor C—Input 28 volts, output 220 volts at 60 MA. Add postage for 6 lbs.

Dynamotor A—Input 12 volts, output 1000 volts at 350 MA. Shipping weight, 72 lbs.

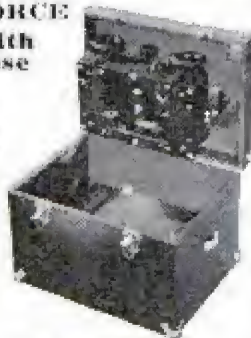
Dynamotor B—Input 6 or 12 volts, output 500 volts at 160 MA. Shipping weight, 30 lbs.

BRAND NEW ARMY AIR FORCE

ASTROGRAPHS With Case

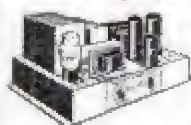
New B29 navigation instrument which can easily be used to make a good contact printer, strip map holder, etc. The plywood case 14 1/2"x11"x10" high is perfect as a tool kit, camera, projector case or for building a portable phonograph, picnic kit, make up case, etc., has leather handle reinforced covers, 8 covered compartments in bottom. Cost Gov't \$125.00. Add postage for 20 lbs.

Only \$3.95



ASTROGRAPH FILMS

7 1/2° S. to 37° S. 23 1/2° N. to 8° S. Your Choice
68 1/2° to 54 1/4° N. 28° S. to 45° S. **\$2.50 Ea.**



\$14.95

HEATHKIT AMPLIFIER KIT

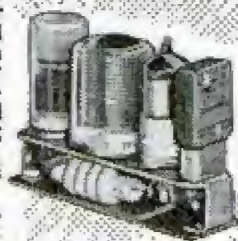
Complete kit INCLUDING TUBES and 110 V A.C. 60 CY TRANSFORMER to build a high fidelity amplifier for radio, phonograph and public address use. Has two preamplifier stages and push pull phase inverter output using 1619 (military type 6L6) tubes. 25 Watt output. With complete parts and instructions. Add postage for 25 pounds.

MIDGET TRANSMITTER KIT \$3.95

Complete kit to assemble a 1 Watt battery operated amateur 80 meter transmitter including tube and crystal. Range up to 500 miles. An ideal beginner's kit. Uses Army parts all brand new. Only accessories needed are sending key and batteries. A complete transmitting station for only a few dollars. Complete instructions supplied. Add postage for 2 pounds.

Key—add post. for 2 lbs.\$1.00

Batteries—add post. for 4 lbs. 3.25



MINIATURE HEADPHONES

\$1.00

Hearing aid type, comfortable, keeps out outside noise, one of the army's best types. Add postage for 2 lbs.



T32 TABLE MICROPHONE

One of the army's finest built by Kellogg. Ideal for public address, transmitters, etc.

Add postage for 5 lbs.**\$2.95**



RADIO BUILDERS' KITS

Power supply kit to convert to army radios 110 VAC\$5.95
5" P.M. loudspeaker for army radios.....\$2.80
Experimenter's Kit, 5 lb. of radio parts for \$1.00
Kit of 20 radio tube sockets for.....\$1.00
Kit of 20 Bypass bathtub condensers.....\$1.00
Kit of 10 radio volume controls.....\$1.95
Kit of 10 Midget variable condensers\$1.95
Kit of 100 color coded insulated resistors \$1.95

RADIO SHOPS write for Free literature on Heathkit service instruments.



G. E. CIRCUIT BREAKER

\$2.95

Protect your electrical equipment, eliminate fuses. 50 AMP 220 Volt rating. Add postage for 4 lbs.

THROAT MICROPHONE

Used by army in noisy applications in aircraft, tanks, etc. Many interesting home uses.

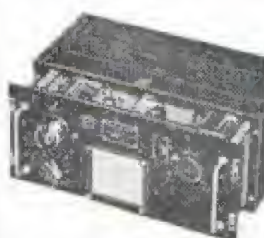
Add postage for 1 lb.**\$1.00**



G.E. BC375

TUNING UNIT

A beautifully constructed tuner containing the best in variable condensers, coils, vernier dials, etc., at least \$30.00 worth of parts, complete with conversion instructions to transmitter and receiver. Add postage for 20 lbs.**\$2.49**



MINIATURE MOTOR

24 V. D.C. size 1 1/4"x1"x2" Add postage for 1 lb.**\$2.95**

POWER SUPPLY KIT to convert motor to 110 V. A. C. Add postage for 6 lbs.\$2.49



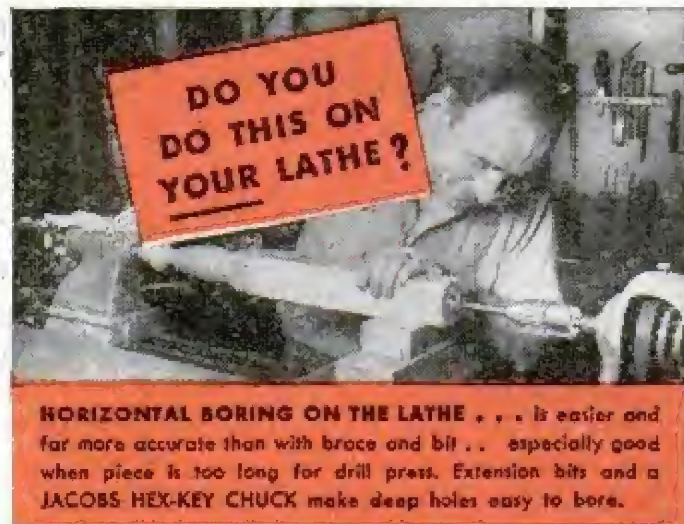
No Orders Under \$2.00

Add postage for weight shown. Write for Flyers listing hundreds of other electronic bargains.



The HEATH COMPANY

DEPT. M . . BENTON HARBOR, MICH.



Your lathe can be taught new tricks to multiply its usefulness when you use tight-gripping JACOBS CHUCKS.

Here is just one of many unusual operations you can perform on your home workshop equipment with the aid of JACOBS CHUCKS.

GET GREATER GRIPPING POWER . . . BETTER ACCURACY . . . LONGER LIFE WITH JACOBS' NEW RUBBER-FLEX COLLET CHUCKS

Exclusive, bonded rubber-and-steel construction . . . no loose jaws . . . no springs . . . not harmed by oils or coolants. Real precision chucks at popular prices. See them at your local hardware dealer's.

IF IT'S A JACOBS . . . IT HOLDS



HEX-KEY CHUCK . . . fits drill press spindles — motor shafts — jack shafts. With Morse taper arbor, fits lathe headstock, tailstock. 4 models, capacities to $\frac{1}{2}$ ", fits $\frac{1}{2}$ " or $\frac{3}{8}$ " shafts.



HAND-TITE CHUCK . . . fits all hand tools and power tools with threaded spindles . . . used on polishing heads, bench grinders, flexible shafts, etc. 3 sizes . . . capacities to $\frac{1}{2}$ ". Models to fit $\frac{3}{8}$ -24, $\frac{1}{2}$ -20 and $\frac{1}{2}$ -24 threaded spindles.

ONLY

Jacobs Chucks

Have The Rubber-Flex Collet
Its Parallel Bite Holds True And Tight



The JACOBS MANUFACTURING COMPANY
150 Jacobs Road, Hartford 2, Conn.

Please send me your new illustrated folder on the Jacobs Rubber-Flex Hex-Key and Hand-Tite Chucks.

NAME.....

STREET.....

CITY.....ZONE.....STATE.....

states. Some states require that a certain amount of work such as sinking a 10-foot shaft be performed within 30 or 90 days and that a statement to the effect that the work has been done be filed with the county recorder.

From then on a minimum of \$100 worth of work per year toward developing the claim is required and a yearly affidavit attesting to the work must be filed. This legal provision was suspended during the war but is now in force again.

There's more to prospecting than luck. Weekend 49ers are discovering that it means work and study. But sometimes they hit the jack pot! As one man said, "If we make a strike, that's good; if we don't, it's still fun."

Deep Sea Rodeo

(Continued from page 119)

weighing 151½ pounds, caught by Nick Kinzbach of Tampico.

(2) Acapulco—a 9-foot 10-inch sailfish weighing 114 pounds, caught by Sarah Bright of Greenville, Ohio.

(3) Veracruz—a 6-foot 2-inch tarpon weighing 132 pounds, caught by Jose Iglesias of Veracruz.

The attitude of the government toward the angler who comes to Mexico for sport fishing is extremely friendly. Fishing licenses are inexpensive. A citizen or foreign resident of Mexico pays 1 peso for one month, 3 pesos for three months, 10 pesos for a year; the foreign nonresident pays 4 pesos for one month, 10 pesos for three months and 20 pesos for a year. (A peso, remember, is worth about 20 cents in United States money.)

Foreign yachts fishing in Mexican waters are charged 25 pesos a month; small craft are charged 4 pesos a month. Many charter launches are available at Mexico's principal ports with experienced fishermen and tackle. The price depends somewhat on size and condition of the boat—ranging from a few pesos an hour up. There are no established prices and a little good-natured bargaining is usually in order.

Mexican customs regulations are extremely lenient about tackle and fishing equipment brought across the border. It is best to bring as much of it as possible, for the added thrill of using your own equipment.

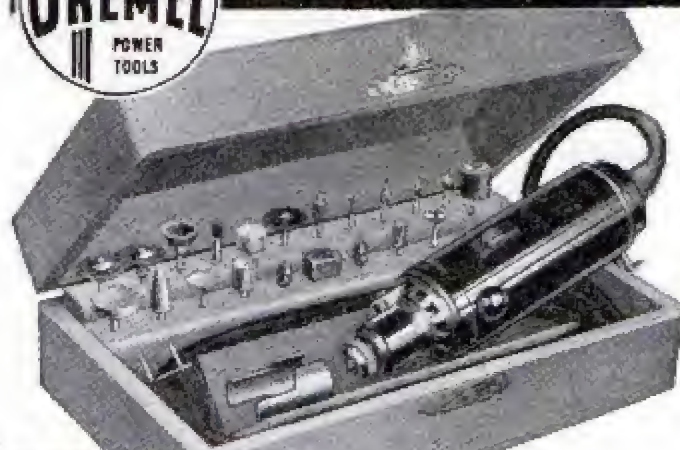
In addition to deep-sea fishing, Mexico offers a limited amount of lake and stream fishing. The government has established hatcheries and is stocking streams and

(Continued to page 264)



MOTO-TOOL

THE "POCKET-SIZE"
MACHINE SHOP



A SHOP-TESTED TOOL

Moto-Tool is backed by over 10 years of industrial use . . . packs extra years of pleasure . . . yet, due to increased production, pre-war prices still prevail!

About 27,000 R.P.M.
Cuts Cleaner . . .
Saves Cutters



LOOK FOR THESE MOTO-TOOL FEATURES

Approximately 27,000 R.P.M., plus dynamically balanced armature provides vibrationless finger-tip control. Moto-Tool has oil-less, sealed bearings • Patented automatic chuck lock pin • Over-size armature shaft, hardened, ground, polished • 110 Volt, AC-DC motor • Sliding snap-type switch • Cord protector • Shock-proof bakelite housing • Dust-filtered air-cooling system • Weighs only 13 oz.



New DREMEL DRILL PRESS

Only \$9.95
(Less Moto-Tool)

Here's a light, portable precision drill press at an amazingly low price. Just the thing for creating costume jewelry, model making, wood carving, routing, etc. Utilizes Model No. 2 Moto-Tool, which can be raised or lowered, swung in any direction or quickly removed in a few seconds for off-hand use. Drill Press stands 12" high. Base is 6 3/4" x 4". Weighs approximately 3 1/2 pounds.

HERE'S BIG VALUE!

MODEL No. 1

MOTO-TOOL KIT

Only \$17.50

This popular kit contains the smaller, lighter Model 1 Moto-Tool and 34 accessories in attractive, lacquer-finish wood box. It's the biggest bargain in the field.

MOTO-TOOL KIT No. 2

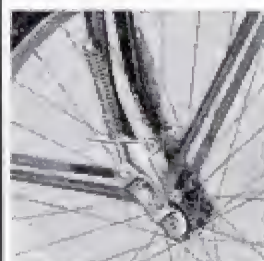
With 23 Accessories (HIGH SPEED STEEL Cutters, Grinding Wheels, Polishing Accessories)

Only \$23.50

MONEY-BACK GUARANTEE: Buy Dremel Moto-Tool from your dealer. If he cannot supply you, order direct on 10 day trial, money-back guarantee. Shipped post-paid for payment in full (send check or money order); or send only \$2, we will ship C.O.D. You pay postman balance plus postage.

DREMEL MANUFACTURING COMPANY • DEPT. 118-C • RACINE, WIS.

Do You Ride a Bike? Here's the Real



SHOCKMASTER for all Bicycles

- LEVELS ROUGH ROADS
- PREVENTS BROKEN SPOKES, WHEELS, FORKS
- MAKES RIDING SMOOTHER, SAFER
- EASY TO INSTALL

A Shockmaster and front wheel shock absorber. Ruggedly constructed of nickel plated steel and engineered for years of real service. It'll pay for itself in added pleasure, saves tires and eliminates many costly repair bills. 20,000 satisfied users. Order yours today. Only \$3.60 postpaid. No C.O.D.'s. Complete satisfaction or money back. Dealers Wanted.

H. M. GIBB and COMPANY

1304 PENOBSCOT BLDG. DEPT. A DETROIT 26, MICH.



\$2.95

TORNADO GAS TORCH

The Modern Way of Soldering

Ideal for hard and soft soldering. Will heat quickly; solder will flow freely and smoothly. No compressed air required. Self-adjusting. Safe. Economical. Can be used for annealing small parts and bending metal parts. Generates a heat of 1700° F. Simply connect to any illuminating gas jet with a rubber hose and operate. Tornado Torch No. 119 comes with three tips, (1/8", 1/4", 3/8" blast).

Tornado Gas Torch No. 119 — Complete with 2 tips, for Natural Gas or Bottled Gas; with 3 tips for Manufactured Gas. \$2.95 per set. See your dealer or order direct. Send check or money order — post paid.

Robco Corporation, 202 E. 44th Street, New York 17, N. Y.

Shakespeare's Resinated GLASS Fiber WONDEROD



WON'T SET
RUST
OR ROT

AMAZING POWER AND ACTION

The remarkable resiliency and strength of resinated glass fibers (250,000 lbs. per sq. in.) give WONDERODS amazing POWER and ACTION. Exclusive HOWARD Resinating Process is the secret. Never "gets tired" — keeps alive and lithe, picks a thrill with every cast, every strike! Built and fly-casting models. Buy at your sports store. FREE TACKLE BOOK and Pocket Fishing Calendar. Reels, Rods, Lines, Accessories, Fishing tips. Send coupon.

Shakespeare Company

Dept. 83, Kalamazoo 2, Michigan

Send me your FREE TACKLE BOOK and Pocket Fishing Calendar.

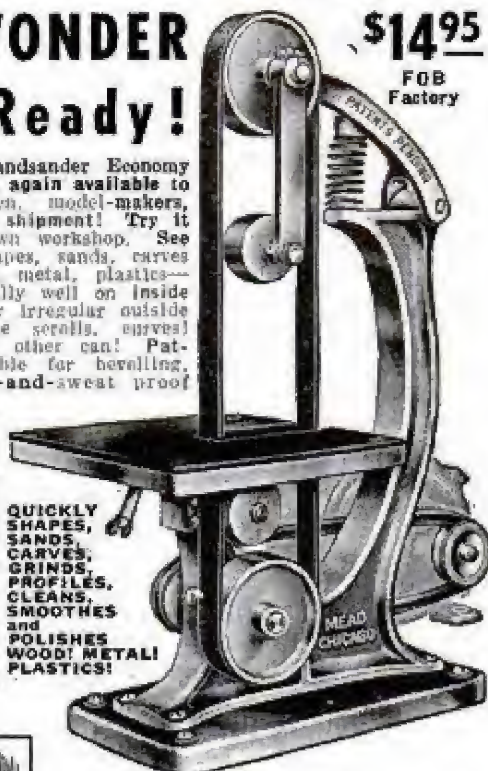
Name.....
(Please write address and zone No. below)



5 DAYS TRIAL!

NEW WONDER TOOL Ready!

The remarkable Bandsander Economy Homeshop Model is again available to hobbyists, craftsmen, model-makers, etc. for immediate shipment! Try it 5 days in your own workshop. See how it quickly shapes, sands, curves and polishes wood, metal, plastics—how it works equally well on inside cut-out openings or irregular outside edges, on intricate scrolls, curves! Gets at places no other can! Patented. Tilted table for bevelling, chamfering. Rust-and-sweat proof top. Self-oiling sleeve bearings. Saves time, labor, money. Normal band speed 1600 feet per min. gives fast, clean, smooth cuts! 3/4-h.p. 1725 rpm. motor recommended. Rush only \$14.95 with Bandsander order — or \$5. balance C.O.D. 5 Days' Trial. Money Back Guarantee. Limited supply, so hurry! (Dealers write.)



QUICKLY SHAPES, SANDS, CARVES, GRINDS, PROFILES, CLEANS, SMOOTHES and POLISHES WOOD! METAL! PLASTICS!



ORDER NOW or Circular FREE!

Order—or write for details on "the machine that amazed the experts!" Send postal NOW.

MEAD SPECIALTIES CO.

4114 N. Knox Ave., Dept. 138, Chicago 41, Ill.

"I THREW MY OLD TOOL BOX OUT

When I saw this New

MASTER Deluxe Model

... The **FINEST** Tool Box Ever Designed"



No. T-5016

Length

16"

Width

7"

Depth

7"



Treat yourself to the newest in tool box styling and arrangement! Two big lift-out trays, each 1 3/4" deep, have removable partitions to make any conceivable arrangement. Newest rounded-corners; streamlined cover with easy-grip, steel core leather handle; continuous piano hinge; modern chromium plated hardware. Richly finished in latest gray wrinkle enamel, baked on. An outstanding ruggedly-made steel box, at only \$7.75, prepaid to your city (\$7.85 in south and west; \$7.95 Pacific Coast states). The finest tool box in our 20 years of box-making! At your dealer... or send check or money order. **MASTER METAL PRODUCTS, Inc.**, 277 Chicago St., Buffalo 4, N. Y.

ASSEMBLE

King Midget



45 MILES AN HOUR

90 MILES A GALLON

Practical, safe, low cost Highway Runabout with all the snap and looks of the finest midget track racers. Home assembly keeps cost low. Just bolt together from our factory built parts. Immediate delivery. See how easy it is: 24-page assembly book, drawings, photos, blueprints. Plus detailed illustrated circular \$1. (refunded first order). Circular only — 25c.

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The SPEED SAW FILER

Saves You Time, Money

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THE SPEED CO., Dept. PM
3025 N.E. Sandy, Portland 12, Ore.



ORDER NOW!



\$2.95

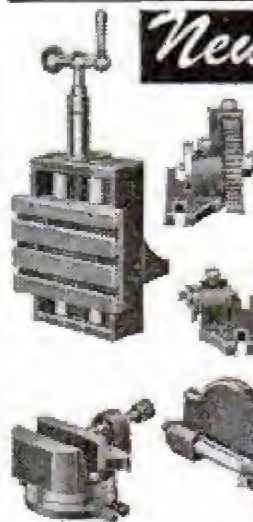


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Spotwelded Heavy gauge steel REDUCED PRICES!
3"-3 1/2" solid tire, 3/8" bushing, ea.49c
2" with 1" solid tire—
—with 1 1/2" and 3/4" steel bearing, ea.99c
—with 7/16" bronze bearing, ea.99c
—with 7/16" KILIAN Ball Bearings, ea.1.19
ADD 10c ea. to all 8" prices for hubcap.
10", bronze hub, 1/2" bearing, 1.75 semi-pneumatic tire, ea.2.10
10" 1/2" KILIAN Ball Bearings, 1.75 semi-pneumatic tire, ea.2.29
Add 10% to ALL prices for P.P. 15% west of Miss. Check or money order only. We guarantee satisfaction. Mail order NOW!

C. W. YOUNG MFG. CORP.
300 Burnett Ave. Syracuse, N. Y.

New MILLING ATTACHMENT



Sizes for 8" to 16" metal lathes

BUILD IT YOURSELF from our sets of semi-machined castings and save \$\$. Can be finished on your lathe alone. Complete working drawings and step-by-step instructions furnished with castings.

Mill keyways, slots, splines, dovetails, flutes in reamers, taps, holes, and special cutters! produce spur, bevel, mitre and worm gears, ratchets and racks; mill flat surfaces, square shafts, mill hexes, spot face, drill spaced holes, bore, etc. on your lathe with this precision attachment. It has a T-slotted table, a vise which swivels for angular milling, a gear cutting fixture and dividing centers.

FREE! Illustrated folder and price list. Includes milling cutters, keyway cutters, drill rod, slitting saws and many hard to get shop items. Mention your lathe. Write today.

HURON MACHINE AND TOOL CO.
YALE 4, MICHIGAN

SMALL EFFICIENT SPEED REDUCER

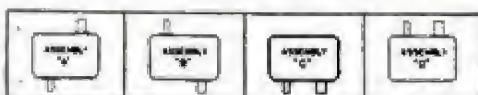
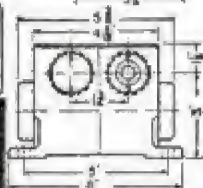
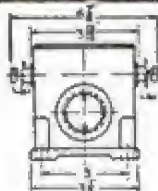
Just the thing for the Home Work Shop, Hobby Shop, Bench Work, Animated Displays, Light Production work. Used daily in thousands of homes and shops. Sturdy, compact. (see dimensions). Case of aluminum. Gears, SAE 65 (British) Gear Bronze. Worm of case hardened steel. Timken Bearings throughout. Torque capacity 100 inch pounds. Available in 4 different assemblies (shown below) and in these standard ratios:

4-1	25-1	64-1	200-1
8-1	30-1	75-1	300-1
10-1	40-1	80-1	400-1
16-1	50-1	100-1	600-1
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When ordering be sure to specify assembly and ratio required. Shipping weight in carton, 8 lbs. Full money back guarantee. Prompt deliveries.



\$18.56
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CONVERT HAND MOWERS TO POWER MOWERS

Takes Less than 3 hours

The Handy-Dandy Lawn Mower Kit fits any hand mower from the 16 to the 20 inch size. Complete with all necessary parts. Kits can be purchased separately or complete with power units.

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Maytag Kit
Completely
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AUTOMATIC RETOOTH

Cuts new saw teeth in 50 seconds — any size 4 to 16 points. Old teeth fall off as chips. Easy to operate. A perfect job. Write today for details on GREATER PROFITS FOR SAW SHOPS.

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FOR HAND
SAWS

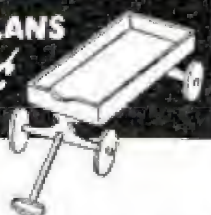
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Happy evenings for you... joyous days for your children... holiday gifts for all. Detailed plans for easy to make, hard to buy toys... wheelbarrow, rocking horse,

kiddie push car, scooter and toy wagon. Send just 10¢ and ask for free list of all the Stanley Plan Sets. **STANLEY TOOLS, 138 Elm St., New Britain, Conn.**



WAR SURPLUS AND OTHER BARGAINS

EMERSON 3 HP MOTOR:

AAF Type D50. This motor can also be used as generator when driven by another motor. Ideal for portable welder, etc. 28 Volts, D.C. Compound, 3800 RPM, 115 AMP, windings glass insulated, blower cooled, shaft dimension 5/8". Weight 27 Lbs. new **\$13.95 each**



SEND CHECK, MONEY ORDER or CASH

SPOTLIGHT: Made for Air Corps, trigger switch for signalling, second switch for continuous light, 12 Volts, throws a powerful beam, seal beam reflector. For use on farms, around homes, trucks, autos, boats, police cars, fire trucks, etc., complete with 15 ft. rubber-covered 2-wire cable. Weight 6 lbs. **\$7.95 Each.** Extra seal beam reflector, **\$1. Each.**



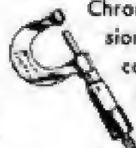
SCOOP:

We have been awarded 100,000 genuine briar pipes by Quartermaster Corps. Assorted shapes and sizes. All popular makes. Set of 6, **\$3.50**



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Chrome plated, precision engineered and carefully tooled to give long life and highest degree of accuracy... all new. 1" capacity, **\$2.25** 2" capacity, **\$3.50 Each.**



25% DEPOSIT REQUIRED ON C.O.D. ORDERS

TRANSFORMER: Jefferson Electric step up or step down transformer. Input, primary 110-117 Volts A.C. Output, from 5 Volts to 650 Volts. Suitable for use with war surplus gadgets, heater relays, radio test filaments, electric trains, house chimes, etc. Weight 10 Lbs. New, **\$7.95 Each.**



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Designed for paratroopers. Unbreakable, laminated, cellulose acetate lenses. Adjustable elastic band. Great for motorcycling, speed boating, skiing, hot-rod driving, etc. All new... 2 pair for **\$1.00.** (One polarized and one clear.)



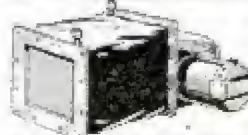
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Type Z — 2" x 1" x 3/8" Mfd. by Microswitch Corp. Can be used normally opened or closed. For automatic contacting — light, sound, model train systems, chimes, etc. New, 3 for **\$1.** Aluminum Spring Actuator to fit above Microswitch. 3 for **\$1.**

ALL PRICES F.O.B. CULVER CITY, CALIF.

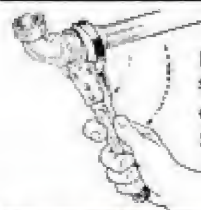
CLAMPS: Rubber lined, aluminum, hundreds of uses in any shop. Assorted sizes, all new. 5 Doz. **\$1. — 500 \$5.00**



BLOWER COOLER or HEATER:

For trailers, autos, offices, darkrooms, homes. DUMORE Motor, 1/6 cont. HP, Amperage 7.5, RPM 6400, 24 Volts. May also be used as dryer. Simple installation, radiator type, copper coils. Transformer advertised in this ad will operate this unit from house current. Weight 13 Lbs. New, **\$15.00**

CONDUIT WRENCH:



Mfd. by JOAR. Jaws pass over conduit, pipe or tubing, slips down to snugly encircle fittings. Slight pressure tightens or loosens fittings. Will not mar or kink material. Set of 8. All new wrenches, Nos. 4-6-7-8-10-14-22-28, (Reg. cost \$50.00), **\$10.00 per set.** Weight 4 lbs.

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Socket Sets . . Sockets . . Parts

Your wrenches are always handy when they're in sets. $3/8"$ - $1/2"$ - $3/4"$ Square Drive. Ratchets, extensions, speeders, flex and deep wall sockets in rugged steel boxes. Literature gladly sent.



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WITH . . .

MULTI-PURPOSE AMBROID



If you want permanent results from an adhesive, you can't equal multi-purpose Ambroid liquid cement — for home workshop, household or factory. A quality leader for 37 years, ready-to-use Ambroid is waterproof, transparent, quick-drying, extra strong. Flexible, heat-and corrosion-resistant. For assembling, repairing or mending jobs, keep Ambroid handy. At your dealer's, or send 25¢ for big 2-oz. tube post-paid. Money back guarantee.

Also 50¢ 4-oz. tube. Pts., qts., gals., for industrial use.



303 Franklin St., Boston 10, Mass.

lakes with trout and black-bass fingerlings. Best lake fishing is to be found between Mexico City and Guadalajara—Patzcuaro, Chapala, Cuitzeo, Lerma and San Miguel Regla. Best stream fishing is to be had in the rivers that tumble out of the Sierra Madre into the Gulf of Mexico—in the eastern states of Tamaulipas, San Luis Potosi and Veracruz. Streams flowing into the Pacific are not satisfactory because they are dry most of the year and rage with muddy torrents when it rains.

In Mexico, a willingness to experiment is often the sign of a successful fisherman.



First sailfish caught at celebration attending opening of the modernistic Hotel Club de Pesca at Acapulco

Insect life in the tropics and subtropics is somewhat brighter-colored than that in the United States. Trout, for example, may take a royal coachman and not even sniff at a brown hackle.

So take a tip, bring along a well-stocked fly book and a wide variety of spinners. Whether you're happiest on the afterdeck of a cabin cruiser plowing through blue waters, or casting a spinner into a quiet lake, or working the riffle of a stream, consider Mexico for your next fishing trip.

Let one angler explain its lure:

"The sportsman will find greater numbers and kinds of game fish in the waters bordering Mexico than he ever dreamed of in any fishing grounds.

(Continued to page 268)

Be "sittin' pretty"

For more fun
fishing in '48!

See your
Evinrude dealer now!

Here are the facts. Not for years before the war were there Evinrudes enough to satisfy top-of-the-season demand. Now, the number of sportsmen who want Evinrudes only has multiplied many fold. So, if you want fishing features and performance only Evinrude offers, it's wise to see your dealer now!

There's a "fishing" Evinrude just right for you. The handy Sportsman and sparkling new Sportwin give you the revolutionary Weedless Drive . . . power where you please . . . through thickest weeds and over rocks, snags and reefs. For famed four-cylinder performance on larger craft choose the Zephyr or the Lightfour. Look for your dealer's name in your classified phone directory under "Outboard Motors." Catalog Free—address EVINRUDE MOTORS, 5707 N. 27th St., Milwaukee 9, Wis.

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Full size factory copied plans
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Chris-Craft Cruisers—Express Cruisers, Runabouts, Owens Yachts, Harbor's "Hares 40" for mantel, den or actual sailing. Fast, strong, waterproof. Built same as actual boat-frame construction. Speeds to 41 M.P.H. with engines. Send 10c for literature on all models, fittings, special motors and drive units. Models endorsed by Chris-Craft, Owens and Harbor Boat Co's. Write Today! No C.O.D.'s.

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**SOUTH
BEND**

QUALITY LATHE DOGS

Heavy malleable iron. Tail shaped to fit face plate slot. Standard Dog has square head screw. Safety Dog has headless screw. Prices for either style.



Capacity	Price*	Capacity	Price**
$\frac{1}{2}$ "	\$0.80	$\frac{1}{2}$ "	\$0.70
$\frac{3}{4}$ "	.95	$\frac{3}{4}$ "	.75
1"	1.05	$\frac{5}{8}$ "	.90
1 $\frac{1}{2}$ "	1.20	1"	1.00
1 $\frac{3}{4}$ "	1.40	1 $\frac{1}{2}$ "	1.10
2"	1.55	1 $\frac{3}{4}$ "	1.35
2 $\frac{1}{2}$ "	1.70		
3"	1.95		
3 $\frac{1}{2}$ "	2.20		
4"	3.00		
	4.00		

455A E. Madison St.
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SOUTH BEND LATHE WORKS

Get this
Valuable Book

Helps you select
a suitable design
for Home,
Playroom
Summer Cottage
or Camp



All For
25¢

If You're Building Your Own Fireplace

here's an easier, fool-proof way to do it.

Choose a design that will look well with the materials you have available. Prepare a concrete or brick slab the size of your fireplace. Center your Fyro-Place, the warm air circulating form, on the base and build around it. You will have a well engineered, successful fireplace. You can't fail. Wrap a quarter and enclose it today for this valuable book.

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& TANK CORPORATION**
7 Austin Street Buffalo 7, New York

COMPLETE LOCKSMITH SHOP ONLY \$98.00

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Start Making Money At Once. Order Your Outfit Today. Satisfaction Guaranteed. Send For Catalog.

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KEYS MADE WHILE U WAIT



Now!

Broadcast through your Radio with this New WIRELESS MICROPHONE!

No Connections — No Hookups of any kind — Completely Wireless BROADCAST IMMEDIATELY!

Broadcasts through any radio indoors — outdoors — anywhere. It's a completely self-contained wireless transmitter — a marvel of modern electronic engineering. Talk into it — sing into it — and without plugging in — without connecting wires your voice comes booming through any radio set within a 50-foot radius.

\$9.95
complete

Use it for fun at gatherings, parties, etc. Ultra-Mike is not a toy — it's a rugged, scientifically engineered transmitter in mike form that gives high fidelity — performance.

Loads of Fun — and Practical, Too

Ultra-Mike is highly efficient over a full 50-foot range. It is completely self-contained, with its own tube and long life (easily replaceable) battery. No hook-up or connections are needed. Carry it with you — talk as you walk — and you'll marvel at its fine modulation — its full-bodied volume — the clearness with which your voice is reproduced.

ORDER TODAY. SEND NO MONEY.

Just send name and address and we'll send C.O.D. plus postage, or send \$10.00 and we ship postpaid. Don't delay.

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NEW Auto FLASHER

For Fast, Snappy Drivers

Makes your Stop Light Shout, Flashes 115 times a minute. Fully automatic when brake is applied. Approved by leading Safety Engineers. INSTANT ACTING. If your dealer can't supply you, send check or I.O. for \$3.00. We pay postage. Dealers and Agents desired.

Patented.
Simple to install.

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CLEAR LAND FAST! Powerful 7-HP motor with friction clutch for safe operation. Cuts down timber, brush and hedge; turn blade vertically and saw logs to length. Also furnished with post hole diggers. Has clutch pulley for belt work.



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Waterproof tarpaulins, war surplus (Used), perfect condition. Originally made for tents. Approx. 5'x8'. Two buttoned together make approx. 80 sq. ft. Complete with buttons attached. Suitable for use as canvas dams, hay covers, truck covers, machinery and equipment covers, etc. Packed in bales 40 each, priced 40 covers, \$1.00 ea.; 15 covers, \$1.50 ea. Less than 15, \$1.75 ea. All FOB, Kansas City.

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make your own Gems 29.50 F.O.B.

All necessary lapidary equipment is furnished, including a super-charged diamond blade for sawing, and all wheels for grinding, shaping and polishing; also complete instructions. The complete equipment as shown, less motor and belt, for only \$29.50, f.o.b., Burlington, Wisconsin. Write today for information and literature.

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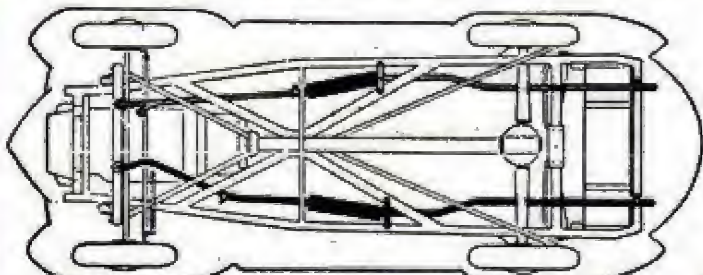
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DEEP TONE

DUAL MUFFLERS

LONG LIFE



1935 TO 1947—V-8 FORD AND MERCURY ONLY

- More Horse Power
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- Better Gas Mileage
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FORD & MERCURY DUAL SETS ...\$20.00

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No Welding, Cutting, Drilling of Holes. All Fixtures Furnished Rubber Insulated Clamps

DEEP TONED Ford, Chevrolet, Ply. \$4.86
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Advance Mufflers 6800 SO. VERMONT AVE. LOS ANGELES 44, CALIF.

Speed Way

No. 117 PORTABLE BENCH GRINDER \$1495

A new type air cooled motor that has 3 times the power of the pre-war model. Protected self-aligning, oil impregnated bronze bearings. A new 1-piece die cast aluminum housing with integral wheel guards and tool rests. Built in switch, rubber covered cord and plug. 1 coarse wheel, 1 fine wheel (4 1/2" x 3/8" x 3/8"). You can never appreciate the sweet running balance and grinding efficiency of this grinder until you test it. Ask your SpeedWay dealer to demonstrate.

Light Duty "Blue Line" Tools

SpeedWay Blue Line Tools are built for use. Each operates at the correct speed for its capacity and operation: Grinders grind at the proper speed to give efficient f.p.m. without excessive wheel wear; drills drill at speeds that cut rapidly thru work but won't burn drill bits . . . or with one of the stands illustrated, quickly convert into a sturdy, inexpensive, lever-operated drill press.

Each has its own specially wound, high torque, long life, air cooled SpeedWay tool motor, and all embody the quality features and "tool sense" developed thru SpeedWay's 35 years of specialization in the design and manufacture of portable electric tools.

Standardize on SpeedWay Tools. You will not only have better tools but in each case more tool for the money.

Sold by hardware, farm implement tool dealers, and tool departments everywhere . . . by many household appliance outlets and electrical stores.



No. 209
Drill Stand
(Less Drill)
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GA KIT
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No. 89
1/2" ELECTRIC
DRILL **\$2995**



No. 69
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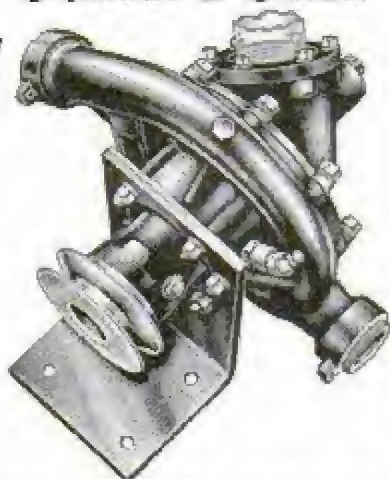
SPEEDWAY MFG. CO.

1863 South 52nd Avenue, Cicero, Ill.

WAR SURPLUS BARGAIN SPECIAL CENTRIFUGAL PUMP

BRAND NEW!

**Ready
for Use
On Any
Liquid
Pumping
Need**



Use It For
**DRAINING
BASEMENTS**

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**HOME
WATER
SYSTEMS**

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IRRIGATION

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**STOCK
WATERING**

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**FIRE
PROTECTION**

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**DRAINING
PONDS,
TANKS, etc.**

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**INDUSTRIAL
PUMPING**

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**COMPLETE WITH
PULLEY AND
MOUNTING
BRACKET —
READY FOR USE**

A super value for all types of intermittent service in pumping large volumes of liquid in home, farm and industrial service. Ideal for home water systems, draining basements, fire protection, etc. On the farm for watering stock, draining ponds, sprinkling, etc. In shops and factories for all types of pumping service.

MOVE LARGE VOLUME QUICKLY

When operated at 1750 RPM, will pump 42 gallons per minute on a 23 foot head; at 3600 RPM on 52 foot head will pump 88 gallons per minute. May be run with electric motor, gas engine or power take-off on tractor.

COMPLETE WITH PULLEY AND MOUNTING BRACKET . . . READY TO INSTALL

Pump has cast aluminum housing—accurately machined bronze impeller vanes. Complete with mounting bracket and 3 1/2" V belt pulley. Shaft rotates on sealed ball bearings with grease gun fittings. Has 1 1/2" threaded intake flange, two 1 inch outlets. Use one or both, as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines.

GREATEST PUMP VALUE IN YEARS
Original cost approx. \$147.00. Sold F.O.B. Chicago. Shipping weight 23 lbs. Complete engineering reports and operating instructions free with pump. You can't beat this pump value at anywhere near this price. Satisfaction guaranteed. Original Cost Approx. \$147.00.

\$29.75

F.O.B.
Chicago



CONTAINS

1 stencil brush; 1 can paint, stencil paste; 1 complete set of metal letters, figures, punctuation and spacers

Here is YOUR identification stencil set! Saves time, money and effort, easy to use, pays for itself. Metal letters, INTERLOCKING to make words. Comes in handy wooden box with sliding top. Ideal for all industries in marking boxes and packages, identifying inventory, numbering doors, etc. GUARANTEED.

COMPLETE KIT with 1" letters **\$2.50** Pre-paid
COMPLETE KIT with 2" letters **\$3.95** Pre-paid

GROBAN SUPPLY CO.

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"Those who have participated in the International Fishing Rodeos held in previous years at Tampico, Acapulco and Veracruz caught game fish in abundance and enjoyed the thrill of holding 'a hot reel and a tight line' on many great fish.

"A new appreciation of fishing and of Mexico awaits those who visit this country of friendly greetings and carefree laughter. It will ever be enshrined in their hearts as it is in thousands of others and in mine."

That was LeRoy H. Dorsey of Chicago speaking—and he should know what he's talking about.

Hedge-Hopping Highway Engineer

(Continued from page 135)

pass over the bump a little of the excess oil is jarred from the bottom of the car. This results in a widening of the natural road oil streak, just beyond the bump in the direction traffic moves, which is quickly discernible in a strip photograph.

The design of new highways will be as sharply affected by this method of studying pavements as surface maintenance problems have been. Pavement cracking may be due to the soil on which the surface is laid, or to the surfacing material itself.

By referring to soil maps, the Indiana engineers could study the Sonne pictures, which had been flown for stretches of pavement on the state's highway system at altitudes of 100 to 400 feet, and make accurate interpretations as to which of these causes of breakdown was responsible in a given area. Where poor aggregate in the surfacing material caused the breakdown, the highway experts could refer to the construction records and find that aggregates (usually those containing chert and other impurities) were always present where the breakdowns occurred. Needless to say, future highway surfaces will not be made of these aggregates.

An early result of this new method of studying highways through strip photography will be its effect upon traffic safety. Because the airplane moves so speedily compared to the vehicular traffic below, a very true picture of traffic distribution and density is provided. The causes of congestion and the resulting sources of accidents can be quickly discerned and appropriate corrective measures can be taken. Also, the location of bridges, sharp curves, railroad crossings and other danger points that need posting can be quickly located.

The discoveries of Professor Woods and his associates may have far-reaching results, not only for the state of Indiana, but for the entire nation.

Groban Really Offers Bargains—Available Now!

**WAR SURPLUS
BARGAIN SPECIAL**



AUTO COMPASS

Know where you're going at all times with this NEW North Star brand auto compass. Easily mounted on automobiles, aircraft, boats, etc. Comes complete with mounting bracket and instruction sheet. Can be manually adjusted. Easily compensated. Formerly \$4.95—NOW **\$2.95**

GRINDING WHEELS

Actually
Worth \$50.00!



A wonderful buy! 350 pieces incl. 35 ass't. Grinding and Cut-off wheels up to 10 inches diameter. 1/16 to 1/4" face. 1/4 to 3 in. holes. Ass't grits—all brand new—Made by Norton, Carborundum, Macklin, Bay State, etc. Also included are 100 slotted disc cloths; 100 paper discs; 20 pencil rolls; 20 abrasive strips; 2 felt bobs; 2 felt wheels; 1 4" rag buff; 3 honing stones; 10 abrasive sleeves; 10 mounted stones, 1/4 and 1/2 shank; 2 mandrels; 2 rotary files, 1/4 shank; 50 abrasive discs; 2 72" abrasive belts; 5 9x11 abrasive sheets.

SATISFACTION GUARANTEED. 350 PIECES—Ass't sizes
FOR Chicago—ALL FOR ONLY.....

\$6.95

HAND GRINDER STONES

41 Piece Assortment

For home and Shop—Packed in attractive set-up box as illustrated. Would cost well over \$15.00 if bought separately! Consists of: 20 Mounted Stones. Assorted shapes and grits, all on 1/2" shanks. 10 Mounted Stones. Assorted shapes, all on 3/32 inch shanks. 10 1x1/2x1/8 inch grinding wheels. Top quality and all brand new. 1 1/4x1/2 inch Mandrel.

SATISFACTION GUARANTEED—
Postpaid in U.S.A. COMPLETE 41
PIECE BRAND NEW ASSORT-
MENT, ONLY.....

\$4.95



ALL
BRAND
NEW

HI-PRESSURE CYLINDER



NEW, 1 1/4"x2". 1CG3A
1800—P.S.I. Can be filled
with CO2 and used as tire
inflator or fire extinguish-
er. Also as pulsating tanks,
storage tanks. Wheel control
brass valve. COST THE
GOVERNMENT \$9.80. NOW ONLY.....

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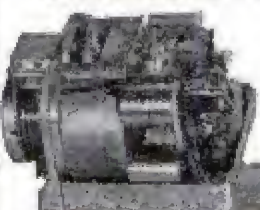
Brand new. Formerly used on amphibious Jeeps. Has shaft 3 ft. long and 5 inch pulley.

with ball bearings in pulley, can be used for power take-off with winch and hoist.

Only **\$4.95**

Worth a lot more!

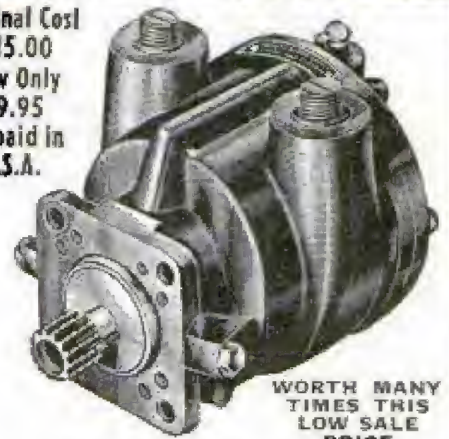
AUTOMATIC PILOT SERVO UNIT



24V. electric motor with forward and reverse solenoid clutches and brake assembly. To open and close garage doors. Adaptable for boat control, tapping machine, etc. Has powerful gear set-up, limit switches, 8"x6"x6". ONLY.....
F.O.B. Chicago

\$7.95

Original Cost
\$45.00
Now Only
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Prepaid in
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WORTH MANY
TIMES THIS
LOW SALE
PRICE

BRAND NEW!

VACUUM-AIR HYDRAULIC GENERAL PURPOSE PUMP

Use Them for
OIL BURNERS

SPRAYING
MACHINES

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MACHINES

COMPRESSORS

VACUUM
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• Originally cost \$45.00. May be used as air or fluid pump—for pressure or vacuum. Standard 3/4 inch pipe thread with interchangeable ports. Will pump 7 1/2 gal. SAE 30 oil per minute at 300 RPM. Builds air pressure of 30 lbs. per sq. in. at 1000 RPM. Vacuum will draw 26 inches of mercury at 1750 RPM. Develops up to 120 lbs. per sq. inch of hydraulic pressure, which in conjunction with a 3 inch hydraulic cylinder will lift 840 lbs. minimum. Runs forward or reverse. Self aligning shaft. Die cast aluminum housing 6x4x4 inches. Has stainless alloy steel vanes and impeller. Made by Bendix Avia, Corp. Spline terminal for direct drive—readily replaced with a pulley. Recommend a 1/4 H.P. or stronger electric motor. Rated capacity 1500 RPM with high overload factor. Special price for quantity users. Complete illustrated engineering report and instruction booklet FREE with every pump. Send check or money order today! Postpaid in U.S.A.

\$9.95

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Brand New! In original packing. Each with four interchangeable lenses. SHOCK PROOF FRAME—SHATTER-PROOF LENSES. Use them for all outdoor sports, beach, motoring, boating—anything. Heavy windproof sponge rubber ventilated frame with snap button lens retainers! Adj. elastic head band. Clear, red, green, amber flexible, shatterproof lenses, all instantly interchangeable, with carrying case. They won't last long at this price—it's smart to buy an extra.....
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150 PIECE ASSORTMENT MOUNTED STONES, FILES, BURRS, BUFFERS

Amazing value for home and shop! There are hundreds of uses for this great array of wanted parts.



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BRAND
NEW

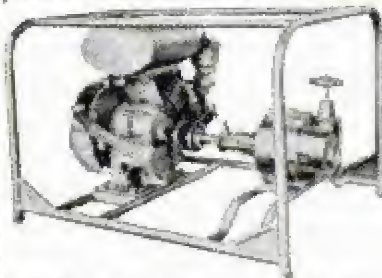
- 3 Fast cutting grinding wheels 3/4x1/2"
- 8 Mtd. grinding stones on 1/2" shank
- 4 Cutters, ass't shapes 1/2" shank
- 4 Mtd. wheels on 3/32" shank
- 100 Emery discs, 7/8" med. grit
- 2 3x1/2x1/16" rubber wheels
- 1 Circular saw 3/4x.023x1/8"
- 1 3/4x3/32 mtd. wire brush
- 3 Ass't bristle brushes, mtd.
- 3 1" sewed muslin buffs
- 3 Cutters 3/32" shank
- 5 1/2x1/16" mandrels
- 6 7/8" cut-off wheels
- 5 Ass't felt wheels
- 1 Roughing stone
- 1 felt cone

REGULAR RETAIL VALUE over \$20.00. NOW—for years of service—get this great assortment for only.....
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BRAND NEW GOVERNMENT SURPLUS EQUIPMENT



PORTABLE PUMPING UNITS. Gasoline engine driven rotary pump, good lift and pressure, 1 1/2 in. suction, 1 1/4 in. discharge, adjustable flow control. Direct connected to Johnson 4 cycle gasoline engine, foot starter, develops about 1 3/4 h.p. mounted in steel frame base, capacity to 3000 gals. per hr., can be used for pumping water, gasoline, kerosene, distillate and most oils.

Price complete boxed F.O.B. . . \$96.00
As above, less engine F.O.B. . . \$35.00
Suction hose, wire wound 16 ft. length with connection . . . \$ 6.50
Discharge hose, wire wound 20 ft. length with connection . . \$ 6.50



ELECTRIC HEAVY DUTY PORTABLE DRILL

Electric 3/4 in. drill 110 volt A.C. - D.C. 3/4 in. Jacobs key chuck takes 3/16 in. to 3/4 in. (incl.) standard round shank drills. Easily handles 3/4 in. drill in metal, 1 3/4 in. in wood. 2 speed switch in handle 275-375 r.p.m. chuck speed. Heat treated machined steel gearing enclosed precision ball bearing equipped. Oilomatic safety clutch. 50 ft. extra heavy oil and weather proof Electric cord with grounding wire. Electric motor, switch, gearing and housing made by nationally known precision manufacturer in U. S. Each drill carefully tested and packed in original individual shipping carton with cord, chuck wrench and instructions.

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A limited quantity of each item available. Send check or money order. Money refunded if condition not as represented new and unused. All prices quoted are only a fraction of the original purchase price.

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A must tool for electricians, maintenance men, home owners. Reattachable lamp inside Plier tests 110 to 250 Volts. Plier pulls fuses from 10 to 100 Amperes. Shockproof. Requires the use of only one hand. Can be obtained from General Electric or Westinghouse stores, or from local electric dealers.

Price \$2.75 without Leads, \$1.50 additional for Leads. Order TODAY.
STAR FUSE CO., 233 Canal St., New York 13, N. Y.

PRECISION JEWELERS SCREW DRIVERS

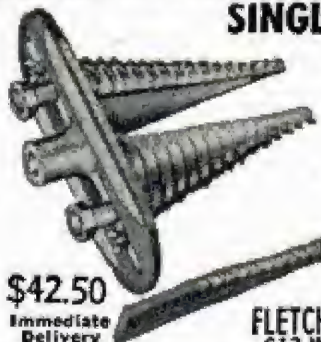
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At last—a complete set of precision screw drivers to meet the needs of every model builder. Not a miniature but the same type set used by U. S. Navy for precision instruments and watches during the war. Brass knurled handles, hexagon heads, finest tempered steel blades. Sizes 2-9. Never before a set of this quality and precision at such a low price. Your money back if not satisfied. C.O.D. \$2.00 plus postage or send \$2.00 and we pay postage.

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SINGLE PHASE COIL HEAD



A fast and simple setup for winding single phase stator coils. Winds any length coils for motor slot length up to 6 inches, with 15 various widths. For motors up to 1 and 2 horse power.

The head is made of aluminum, weighing less than eight pounds. Has one inch hole and key-way for mounting on drive.

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For home workshop, factory, laboratory, garage, outdoors, fishing and hunting.
Made of heavy gauge aluminum. Strong airplane construction. See proof—Just proof.



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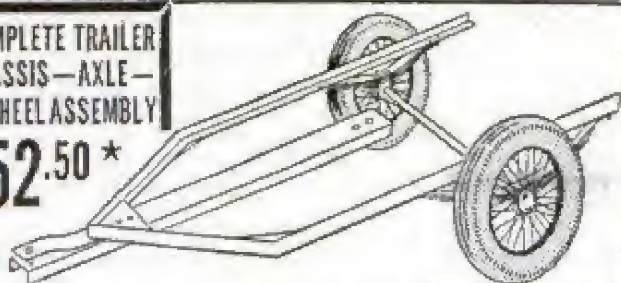
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POPULAR MECHANICS

**COMPLETE TRAILER
CHASSIS—AXLE—
2 WHEEL ASSEMBLY**

\$52.50 *



Never before offered at this low price. Tested to carry 1000 lbs. — built to take hardest usage. **COMPARE!** — in construction-utility-value! You'll agree there's nothing like it.

YOU GET: Complete draw bar assembly, chassis of steel angle, 2 automobile type springs; 2 wheels with Timken roller bearings take standard 4.75 x 19 tires. 2 hub caps and grease rings . . . 91" Overall, 57" Tread. Less Tires, Tubes.

*Shipped K.D., F.O.B. Yonkers or send \$10 and balance C.O.D.

UNIVERSAL YONKERS CORP., 137 Alexander St., Yonkers 2, N. Y.

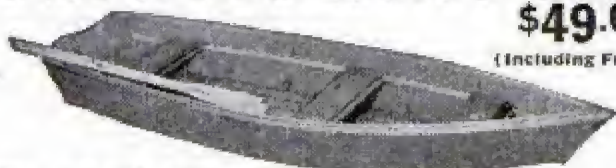


Complete Wheel and Hub Assembly \$9.00 Ea.

PLYWOOD BOAT KITS

\$49.00

(Including Freight)



This **READY-CUT 12** ft. fishing boat can be assembled in 8 hrs. without forms or special tools. Kits are complete including all hardware, paint, and etc. Send for free folder.

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**WAKE UP
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BE FAIR TO YOUR HAIR Want better looking hair? Embarrassed by falling dandruff, itching scalp? Then try **VITABRUSH**, new electric driven scalp brush that gives your scalp a vigorous and invigorating "workout" in just three minutes of fun. Cleans scalp. Stimulates blood supply. Restful. Pleasant. Write *today* for complete information and satisfaction-guaranteed offer. **Hershey Mfg. Co., 3714 Field Bldg., Chicago 3,**

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ANY DRUGSTORE
COUNTER!



Still 10¢ Handy Roll

3-roll package, 25¢

Night and day, at home or away,
always carry TUMS!

Uncle Sam Weighs His Resources

(Continued from page 93)

to many important products. A quarter of it goes into electrical manufacturing, an eighth into wire and rod, a tenth each into building and automobiles and the remainder into light and power lines and miscellaneous products. With production in the next few years running an estimated 33 percent behind demand we shall have to import copper.

Stockpiling of critical materials from foreign sources as insurance in case of war is on a small scale and some skepticism concerning its long-range success has been expressed. Doubts are based on two factors: To be successful it will cost billions rather than millions of dollars, sums which are subject to the approval of a Congress which changes annually; and, such stockpiling is in reality part of an arms race, which means that exporting nations may feel it is against their interests.

Some of the materials to be piled and their uses are: antimony (compounds, lead alloy); asbestos; chromium (steel alloy, plate); copper; diamonds (cutting tools); lead; manganese (steel alloy); nickel (steel alloy); tantalum (electronic tubes, cutting tools); tin; tungsten (steel alloy, cutting tools, electronics); zinc; bauxite (aluminum); cobalt (cutting and die metals); graphite (lubricant, making of crucibles); and mica (electronic equipment).

The iron-ore outlook might be considered alarming in view of the federal estimate of only 73 years' reserves (the Twentieth Century Fund sees only enough high-grade ore for 11 years) but there are vast reserves of brown ores and magnetite which experts say we can learn to recover economically. Bauxite isn't very plentiful, but aluminum can be made from clays which we have in quantity.

Magnesium, baby of the mass-produced metals, mates nicely with aluminum, manganese and zinc and can be "mined" from sea water, although brine wells, magnesite and dolomite ores are richer sources. We have lots of nitrogen, potash and phosphate rock to fertilize the earth—if we don't let the earth get away from us.

We are said to be only six inches from starvation, the half foot of fertile topsoil that covers our productive land. The Department of Agriculture says that of our 460 million acres of high-class cropland, all but 70 million needs protection from erosion. The Federal Bureau of Reclamation and the Army Engineers are combining their efforts in the Missouri River

(Continued to page 276)

101 Money-Making Ideas
in New Larson Catalog.

EVERYTHING
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with **LARSON**
Leathercraft

Make Money

On easy-to-assemble belts, gloves, purses, wool-skin toys and mittens, many other useful items. Wide line to choose from. Moderate priced tooling leathers as well as top quality calfskins. All tools and accessories. No experience necessary; instructions come with materials.

Send ten cents at once for catalog.

J. C. LARSON COMPANY
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\$20000 NAVIGATOR'S SEXTANT \$1750

GOV'T SURPLUS



A precision instrument of recognized quality. These Link Sextants are used for navigating by the stars or other celestial bodies, on large and small boats—for all types of aircraft—anywhere on the face of the earth. The Sextant is to the mariner what the transit is to the surveyor.

FINEST PRECISION CONSTRUCTION

These fine Link Sextants are the product of a famous name manufacturer. Original procurement cost was approximately \$200.00. Now, as war surplus, you can buy one at a fraction of original cost. Instrument is equipped with easy-reading vernier type scale. Bubbles are checked for accuracy. Although slightly used, they are in perfect operating condition. Furnished complete with operating instructions and protective wood carrying case 8x12x4 inches. These are guaranteed to be the genuine Link A12 Sextants. Sold FOB Houston. Send check or money order. Rush your order.

\$1750

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HOUSTON 12, TEXAS

SAVES MANY ELECTRIC APPLIANCES

NICHROCITE REPAIRS HEATING ELEMENTS IN A JIFFY...

Simply overlap ends, apply Nichrocite Paste and turn on current. Used by large utility companies. Trial order, \$1.00; 4 oz., \$2.50; 1 pound, \$8.00.

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FOR MORE TOOL MILEAGE



TOOL NO. 523-7"

General Purpose Gripping Pliers

UTICA DROP FORGE & TOOL
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A TOOLSHOP IN YOUR HAND!

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Make Things From
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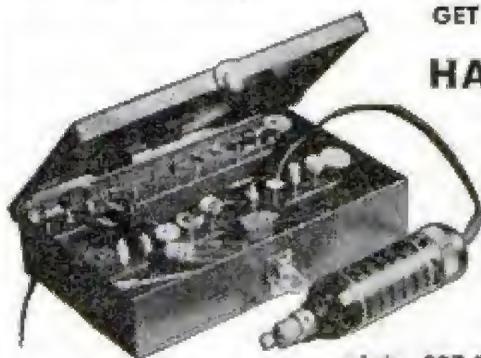
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THE FIRST TOOL OF ITS KIND AND TODAY'S FINEST Smooth, steady power at your fingertips! Perform precision operations not possible with any other portable tool! With a Handee you can turn out professional looking projects for pleasure or profit—ship, plane and train models, delicate, internally carved costume jewelry, wood carvings, puppets, initialed tumblers, etc. AC or DC. 25,000 r.p.m. Wt. 12 oz.

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HANDEE Tool and 40 most popular accessories packed in compact steel carrying case. You'll be amazed at what you can accomplish! Complete, \$27.50. Handee only, with 7 accessories \$20.50.



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THE GIFT OF A LIFETIME!

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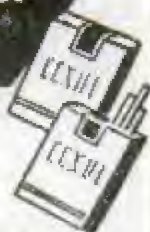
Send ☐ Handee Kit ☐ Handee Tool ☐ Plastic-Craft Kit ☐ C.O.D.
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ACRE of plowed
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The price of two packs of cigarettes is all it'll cost you to plow an acre with the powerful, easy-handling 1½ H. P. **BREADY GARDEN TRACTOR!** BREADY, with all-purpose, year 'round implements, does *all* the work on small acreage and is a *profitable auxiliary* on larger farms!



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**Scientific Discovery
Ends Auto Radiator
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Installed in radiator hose, Butler De-Scaler's galvanic cell action dissolves scale and rust throughout cooling system—keeps water crystal clear, mineral free.



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BUTLER De-Scaler

Butler De-Scalers are available for use in home hot water systems, boilers, Diesel engines, etc.

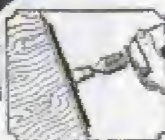
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**SURFACES - FASTER -
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NEW FLEX Sander-Polisher

Works with your electric drill, flexible shaft or chuck equipped motor. Speeds up all grinding, sanding and polishing jobs—fits any 1/4 inch chuck. Rubber face plate flexes into curves for fast, smooth, clean work. Outfit includes 1½ inch rubber disc, with metal flange and shank, fibre backed sanding disc, and heavy wheel's wool polisher. Makes your drill the equal of an \$75.00 grinding or polishing outfit. Satisfaction guaranteed. **\$4.95**
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In refinishing furniture, woodwork, etc. all cracked or peeling portions of the old finish should be removed. It's easy with **WONDER-PASTE REMOVER**. Applied with an ordinary paint brush, this remarkable paste quickly softens up the toughest finish, whether paint, varnish, enamel, lacquer or shellac. Will not run, even on an upright surface. Turns the finish into a soft sludge that comes off easily at every stroke of the scraper. A long-time favorite of painters.

Get Wonder-Paste at your paint or hardware store. Write for Wonder-Paste leaflet, and for advice on your particular removing problem.

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8-inch Plastic STEERING WHEELS

For Soap Box Racers..Toy Autos.. only
Car Bikes.. and other vehicles **\$1.25**

8-inch compression molded plastic steering wheels, with heavy steel insert knurled on one end to keep wheel from working loose, and hole through other end for securing unit to 1/2" steering shaft. Black in color, \$1.25 postpaid. Send check or money-order, immediate delivery.

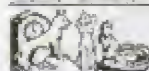
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LIQUID MARBLE

Mold, Brush, Trowel, Spray It!



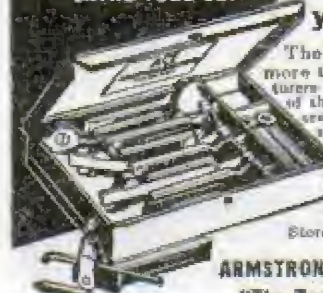
It makes \$1 ceilings. Make MARBLE ZED FLOORS, tile walls. Colorful, glossy, amazing! Easily learned; start in garage or basement. Particulars free.

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**Be permanently tooled-up
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The ACE Set is complete—there's nothing more to buy. Drop forged by the manufacturers of cutting tools used by 99 per cent of the plants and shops in industry they see correctly designed, set of special steel, are finely finished, are stronger—with less waste time. You can cut easier, faster and more accurately with ACE TOOLS.

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3 Turning Tools, 2 Cutting Tools, 2 Flaring Tools, 2 Wrenches, 2 High Speed Steel Cutters and Blades, and 2 Wrenches in fitted Steel Case.



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COMPLETE SELF-PRIMING UNIT (less motor): Pump, motor stand, special bracket, 10' flexible shaft, 14" length 1" suction hose, bolts, etc.

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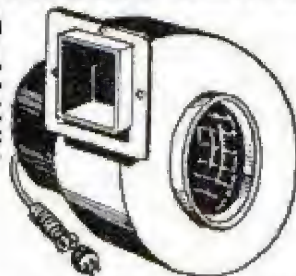
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basin to save soil, control floods, provide water for irrigation and industrial power.

The Twentieth Century Fund estimates that an annual depletion of about 16 billion board feet of lumber is whittling down our forests slightly, but feel that better fire control, and increasing use of substitutes leave us with the future secure. The Forest Service of the U. S. Department of Agriculture, however, gloomily reports that our present lumber shortage may grow worse rather than improve because we are not growing enough trees. It sees a need for about 42 billion board feet of lumber in the coming years and a maximum output of about 33 billion board feet.

Our water power is by no means fully developed and, if it were, it could produce about one fourth the energy produced by coal each year and 40 percent of that produced by petroleum and natural gas.

Standing out like a beacon among our resources is uranium, the mighty metal which provides the charge for the atom bomb and may, within comparatively few years, be an important source of industrial power. The most recent Bureau of Mines Mineral Yearbook reports that we had important reserves, possibly second only to those in Canada and the Belgian Congo, before World War II, but security restrictions blanket the results of what must have been incomparable prospecting since 1939. Qualified authorities estimate the advent of commercial electric power from this source anywhere from 1951 to 1960.

The estimates of our wealth contained in a recent report by the Bureau of Mines and the Geological Survey are in the table below. The reserves are expressed in years of consumption at the average annual rate of consumption from 1935 to 1944:

Magnesium..Unlimited	Fluor Spar	33
Nitrates	Bauxite	23
Salt	Zinc	20
Bituminous Coal	Gold	19
and Lignite.....	Copper	19
4386	Petroleum	15
Phosphate Rock ...	Silver	13
600	Cadmium	11
Helium	Lead	10
235	Vanadium	8
Anthracite Coal ...	Manganese	4
187	Platinum Metals ...	3
Molybdenum	Antimony	3
157	Mercury	2
Rutile	Tungsten	2
124	Tantalum	1
Potash	Chromite...Less than	1
99		
Iron Ore		
76		
Ilmenite		
73		
Arsenic		
55		
Natural Gas		
55		
Cobalt		
53		
Sulphur		
39		
Bismuth		
36		

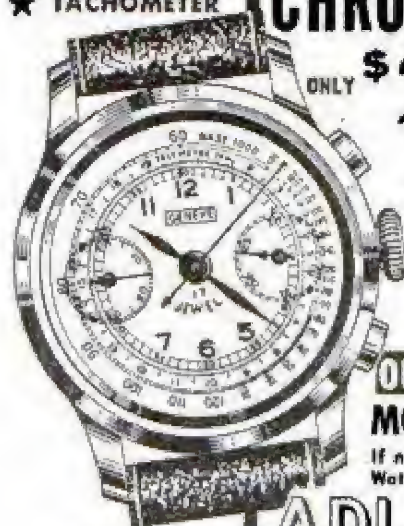
The same report states that we have negligible reserves of mica, flake graphite, tin, long-fiber asbestos, nickel, industrial diamonds and quartz crystal.

Even though we're well off as a nation, experts advise us to draw with care on our bank balance, cashing in our natural resources as slowly as possible.

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- ★ STOP WATCH
- ★ TELEMETER
- ★ TACHOMETER

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Winter driving causes a great accumulation of harmful gum and carbon deposits. For more power, pep and pleasure NOW is the time for the spring tonic Clean-Out—a dollar KARBOUT Engine Clean-Out.

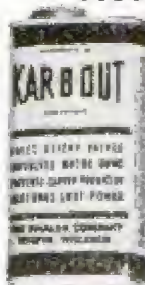
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Sticky valves are freed, lost compression and power are restored, acceleration stepped up, full lubrication assured for longer engine life and quieter operation.

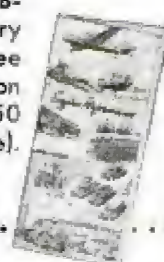
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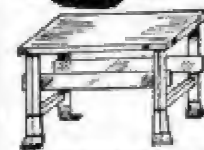
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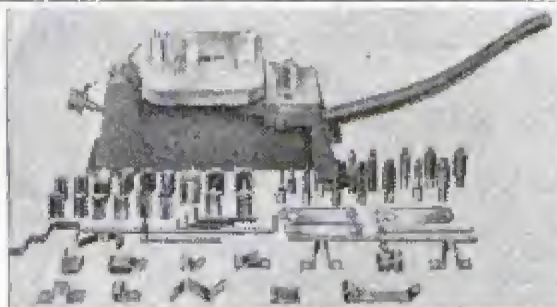
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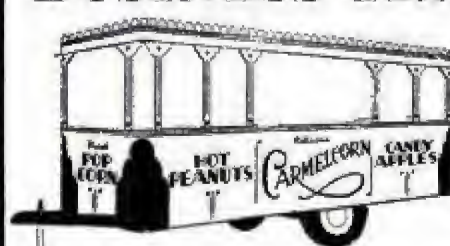


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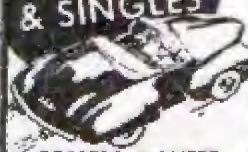
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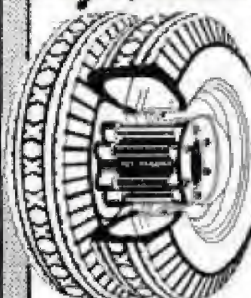
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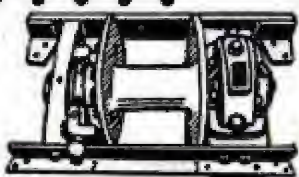
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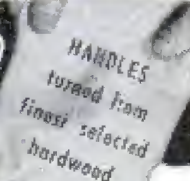
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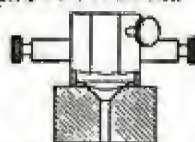
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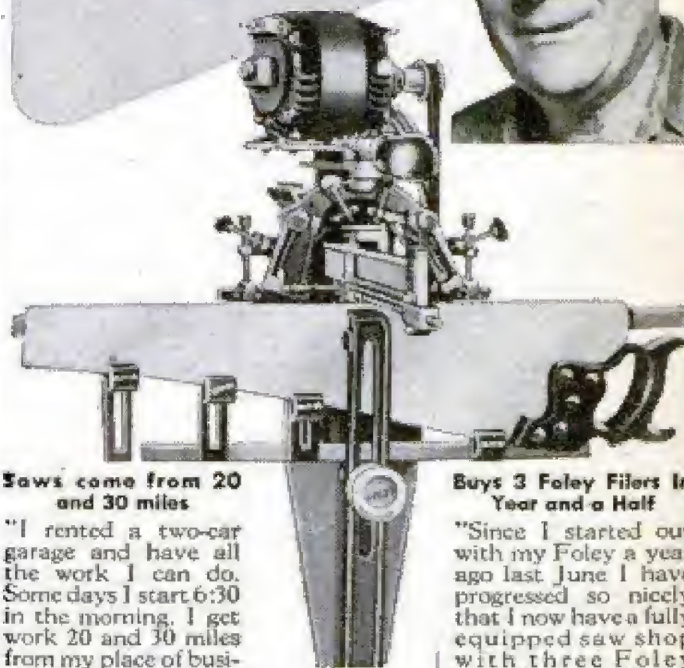
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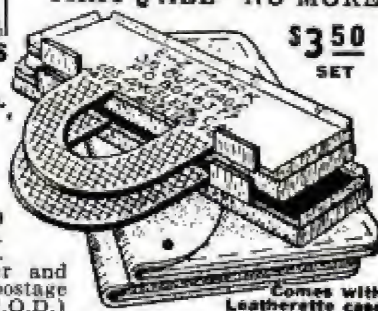


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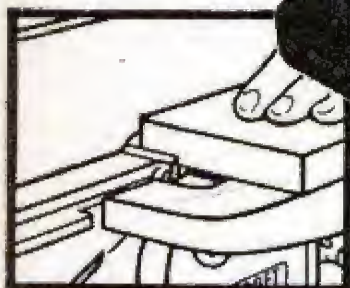
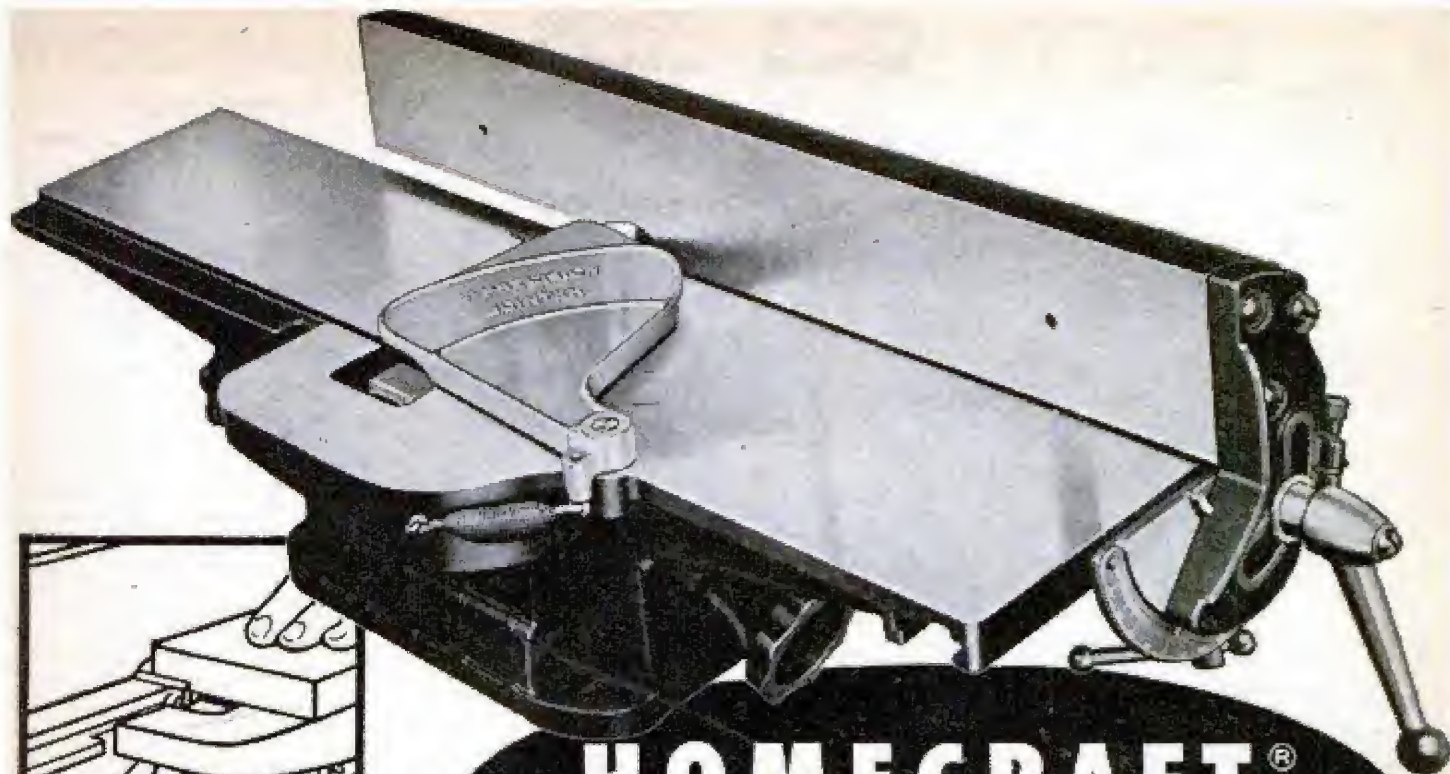
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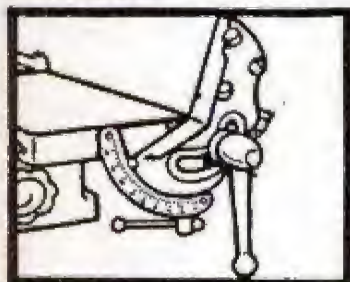


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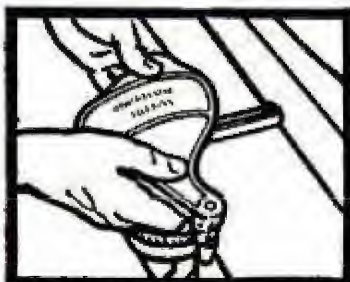
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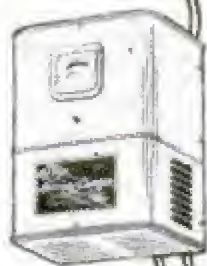
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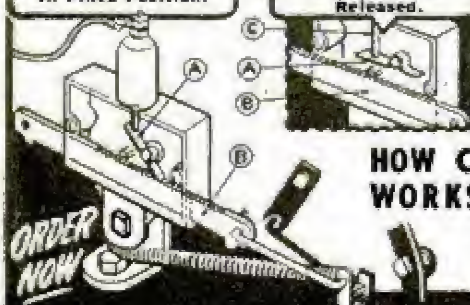
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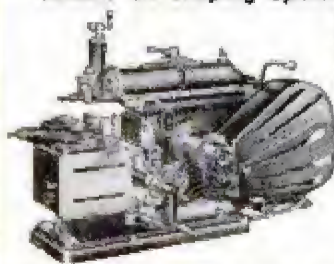
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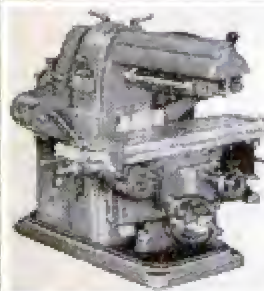
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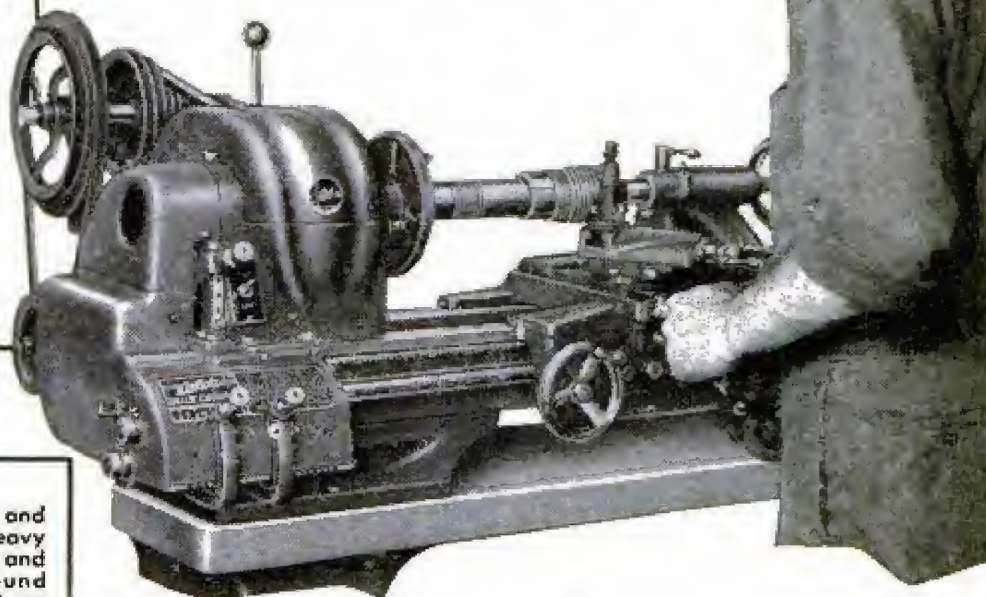
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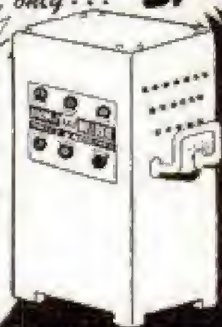
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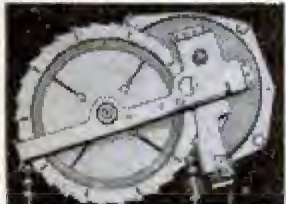
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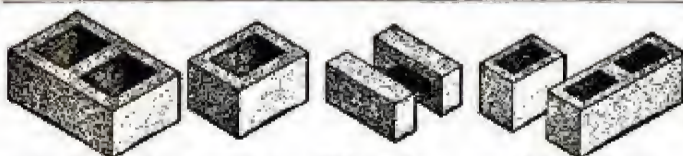
Converts any 1/4 inch Electric
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Drill thereby increasing power.

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Belsaw high speed thickness planer provides for single sur-
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PROFITABLE... lowest

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Produces S4S Finish (surfaced four sides) without
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will make you want to keep fish-
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The balanced reel. Most
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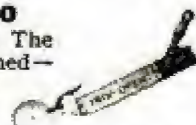
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Silk slightly higher.



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12" x 2 1/2"	Semi-Pneumatic	Ball 1/2" or 3/4"	150 Lbs.	\$ 5.50	\$10.00	\$18.00
10" x 1 3/4"	Semi-Pneumatic	Ball 1/2" or 3/4"	125 Lbs.	\$ 3.00	\$ 5.50	\$10.00
10" x 2 1/2"	Semi-Pneumatic	Ball 3/4"	250 Lbs.	\$ 5.50	\$10.00	\$18.00
20" x 1 3/4"	Semi-Pneumatic	Ball 7/16"	60 Lbs.	\$ 5.00	\$ 9.50	\$18.00
(the above 20" is Dike type 20 Spokes)						
6" x 1 1/2"	Solid	Ball 3/4"	480 Lbs.	\$ 7.85	—	—
6" x 1 1/2"	Solid	Ball 3/4"	640 Lbs.	\$10.35	—	—
4.00" x 8"	Pneumatic	T.R. 1"	700 Lbs.	\$13.50	\$26.00	\$50.00

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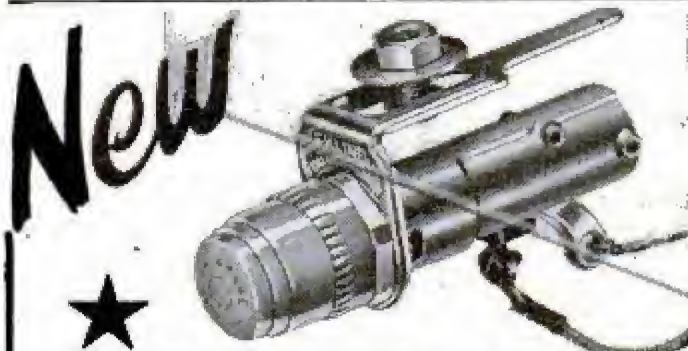
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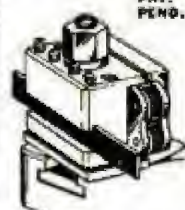
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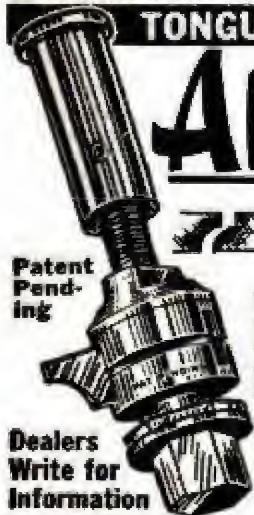


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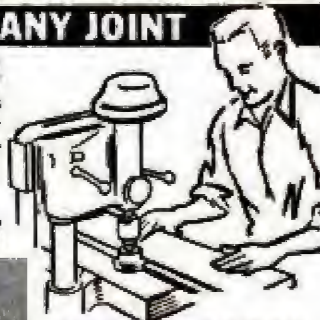
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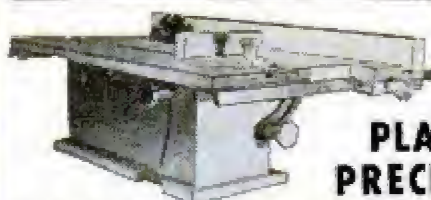
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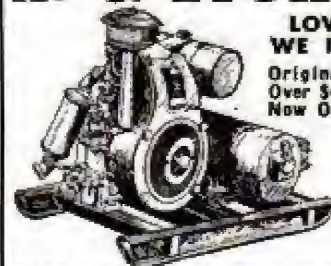
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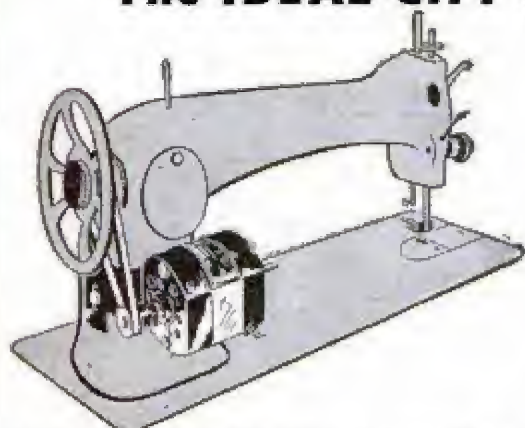


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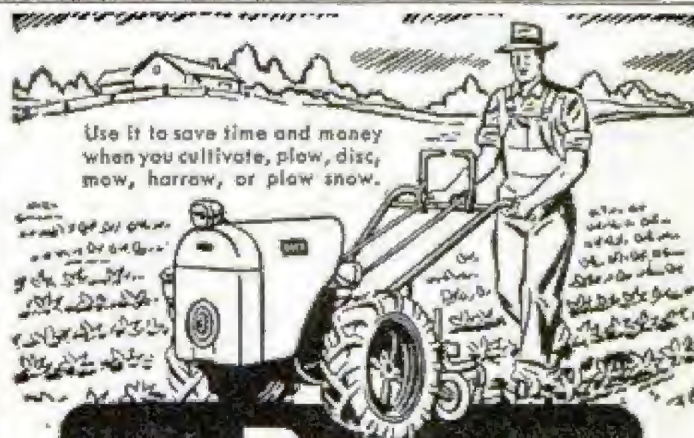
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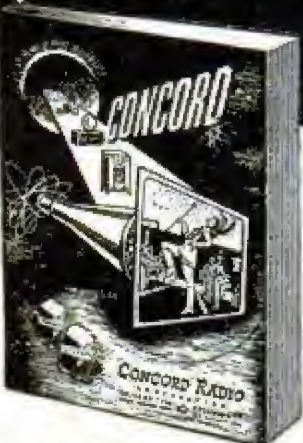
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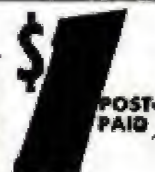
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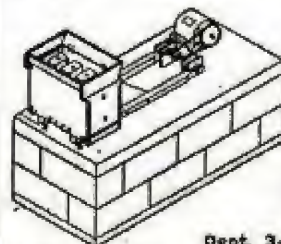
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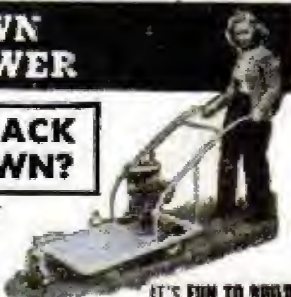
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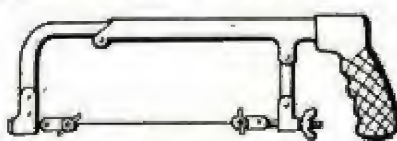
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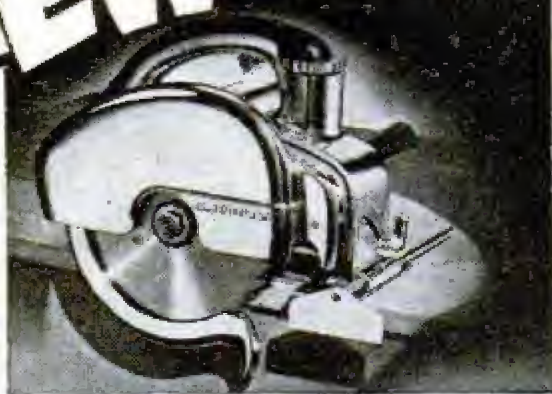
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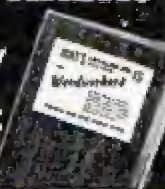
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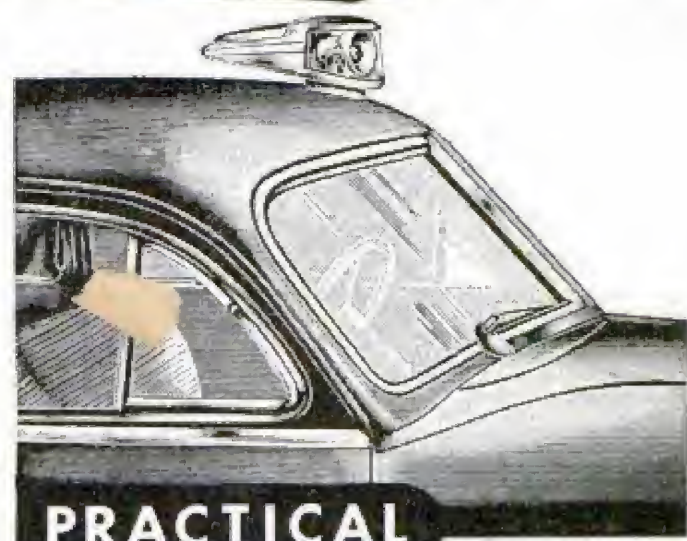
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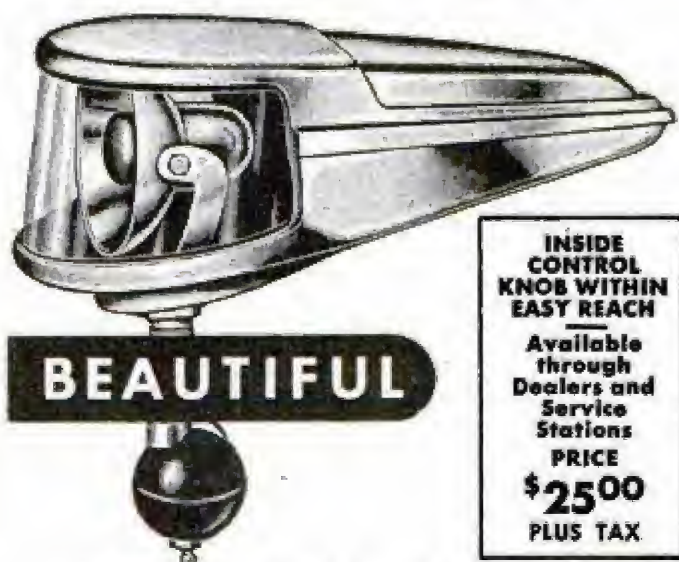


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\$25.00
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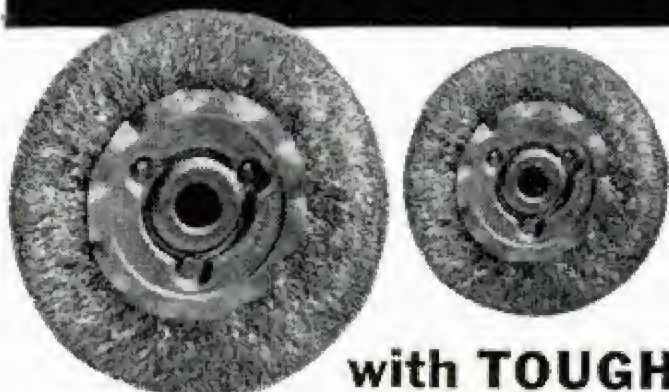
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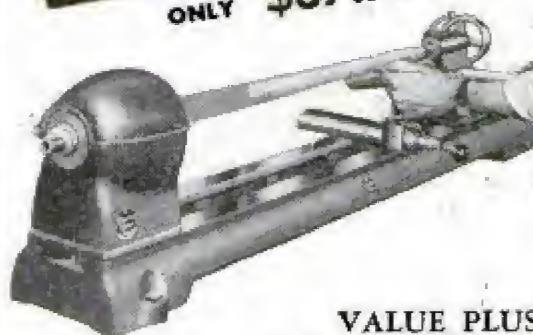
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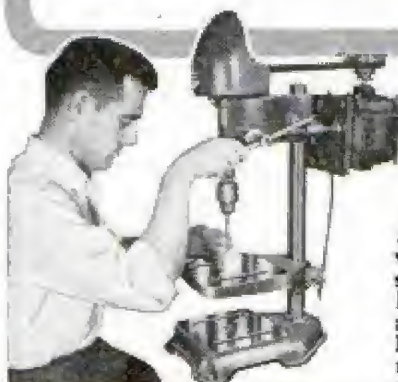
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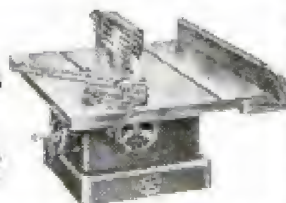
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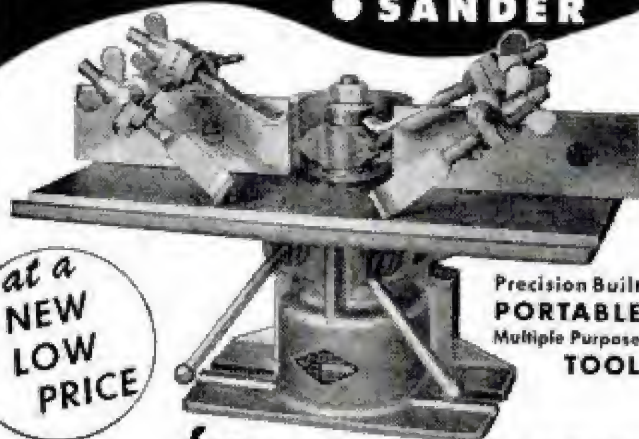
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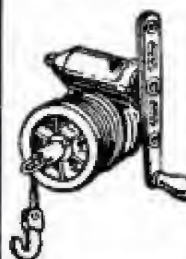
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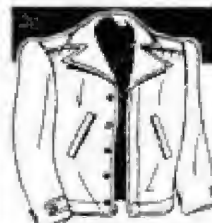
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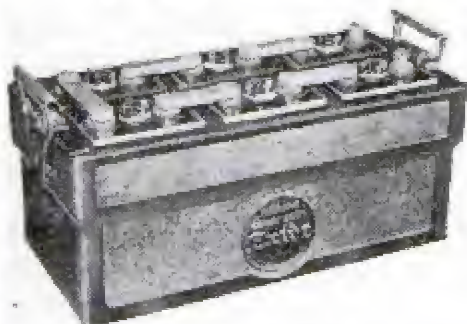
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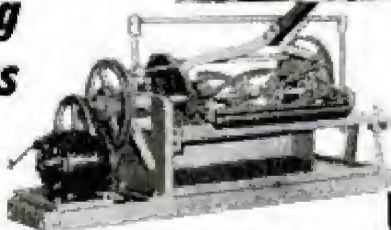
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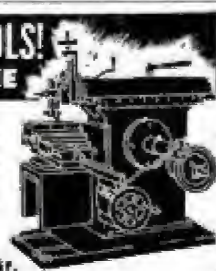
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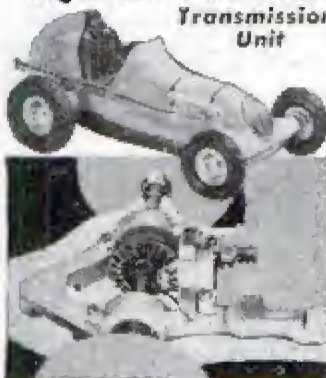
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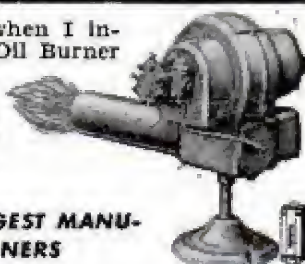
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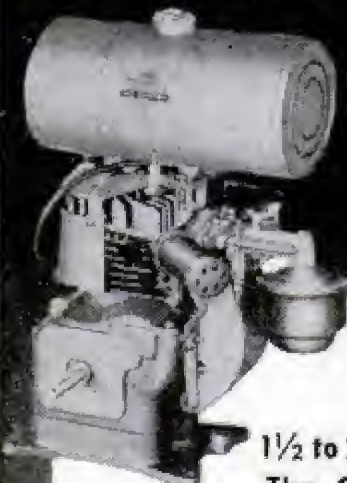
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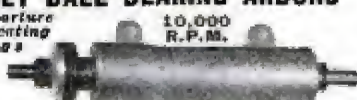
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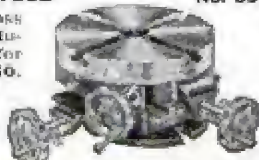
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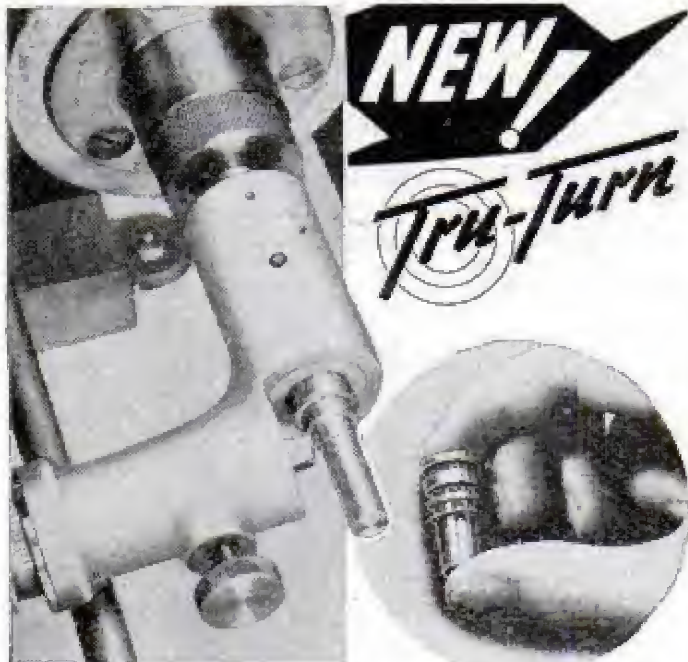
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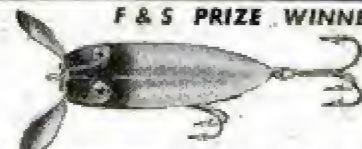
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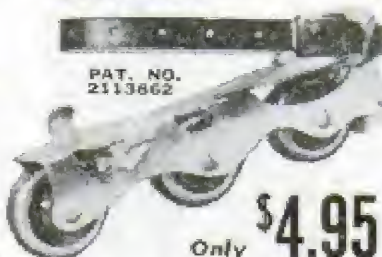
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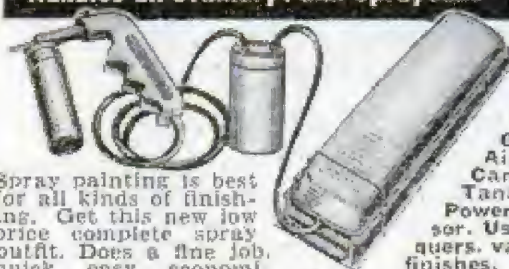
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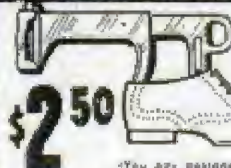
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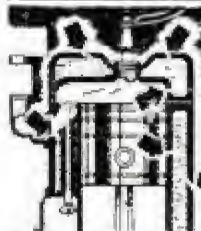


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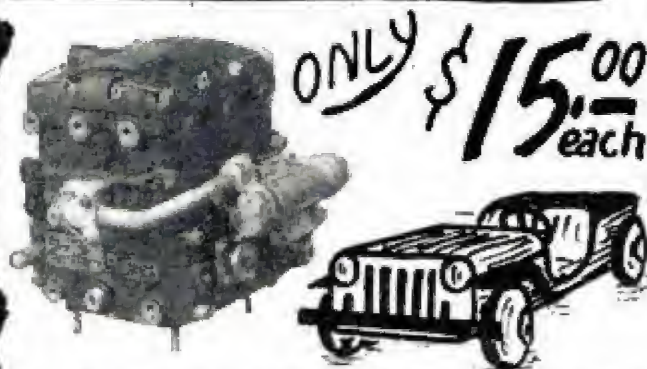
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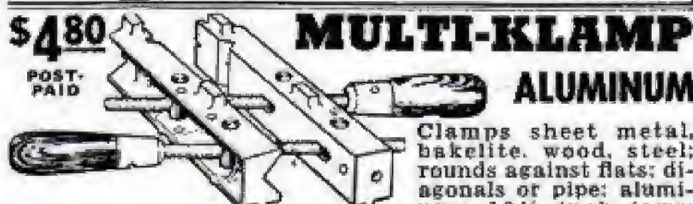
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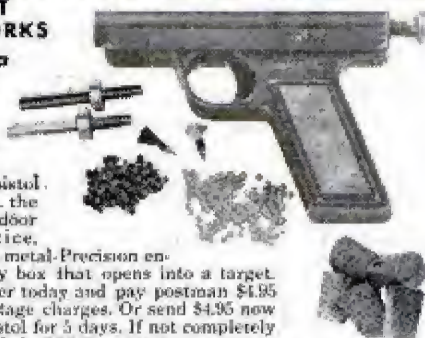
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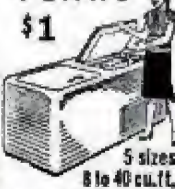
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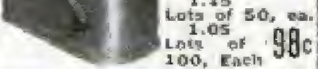
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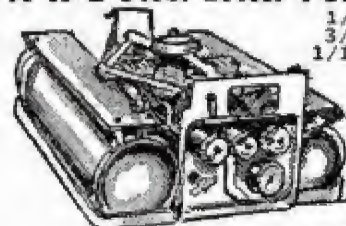


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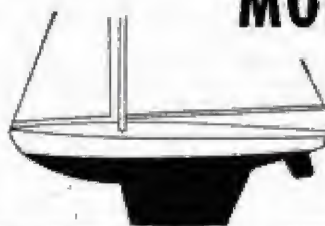
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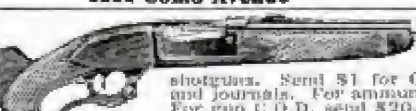


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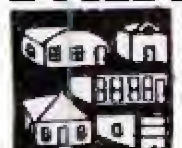
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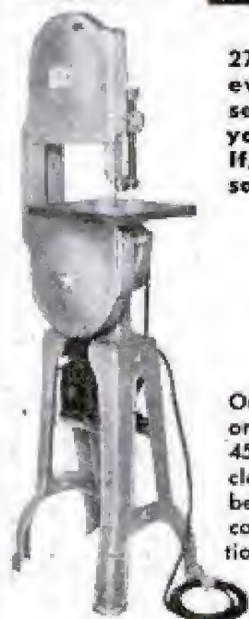
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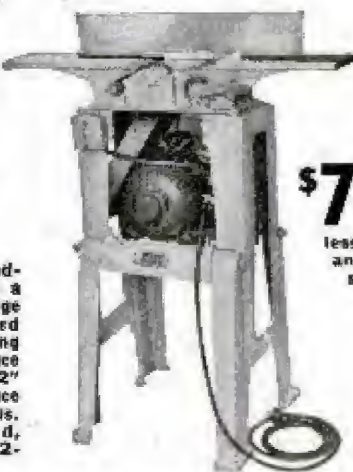
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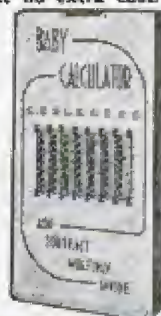
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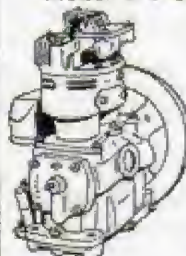
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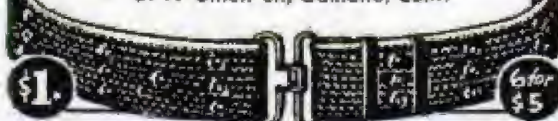
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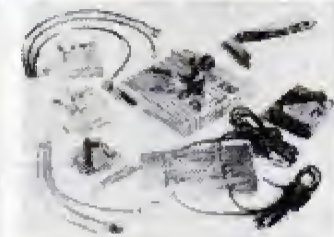
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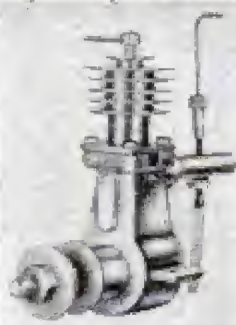
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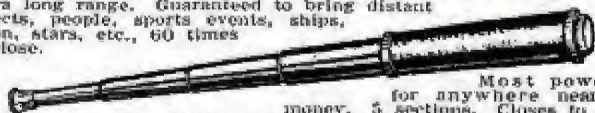
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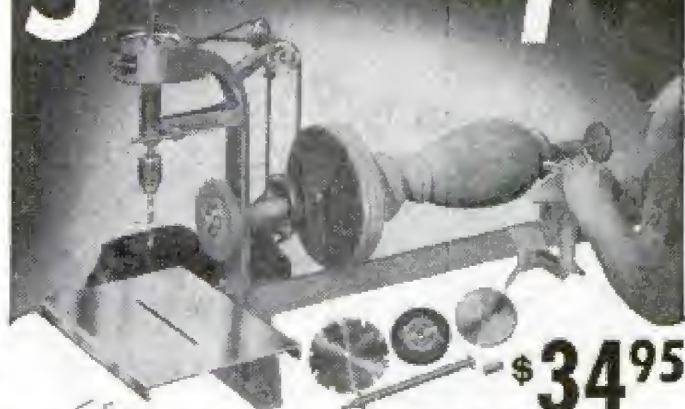
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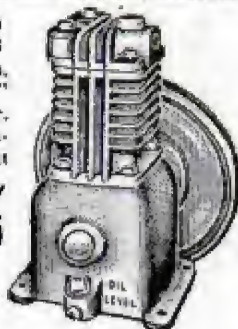
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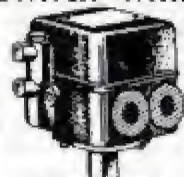
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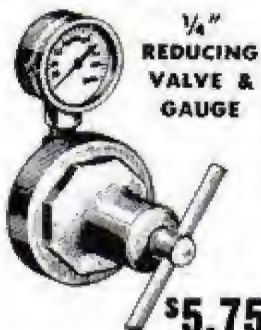
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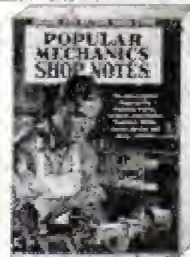
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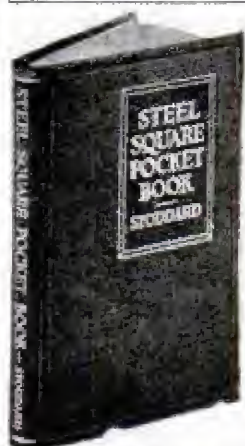
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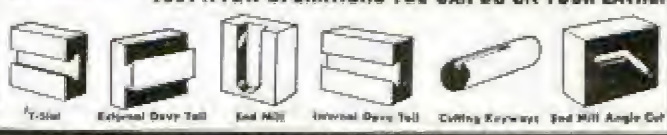
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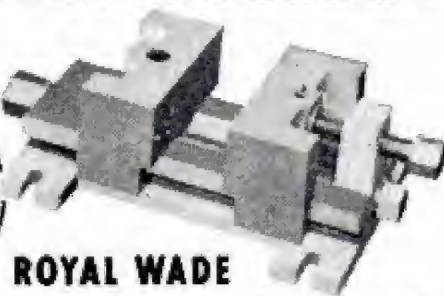
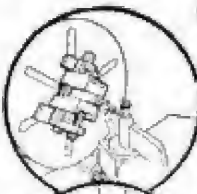
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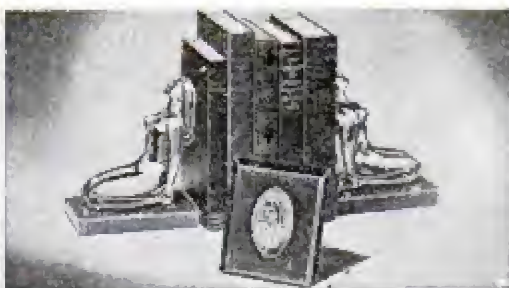
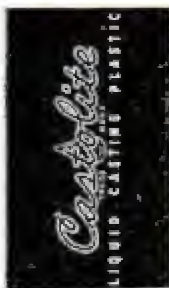
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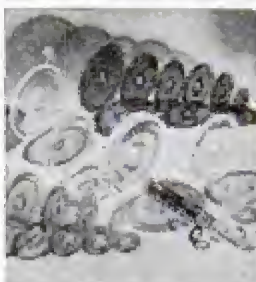
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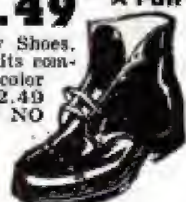
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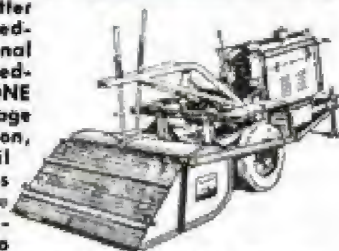
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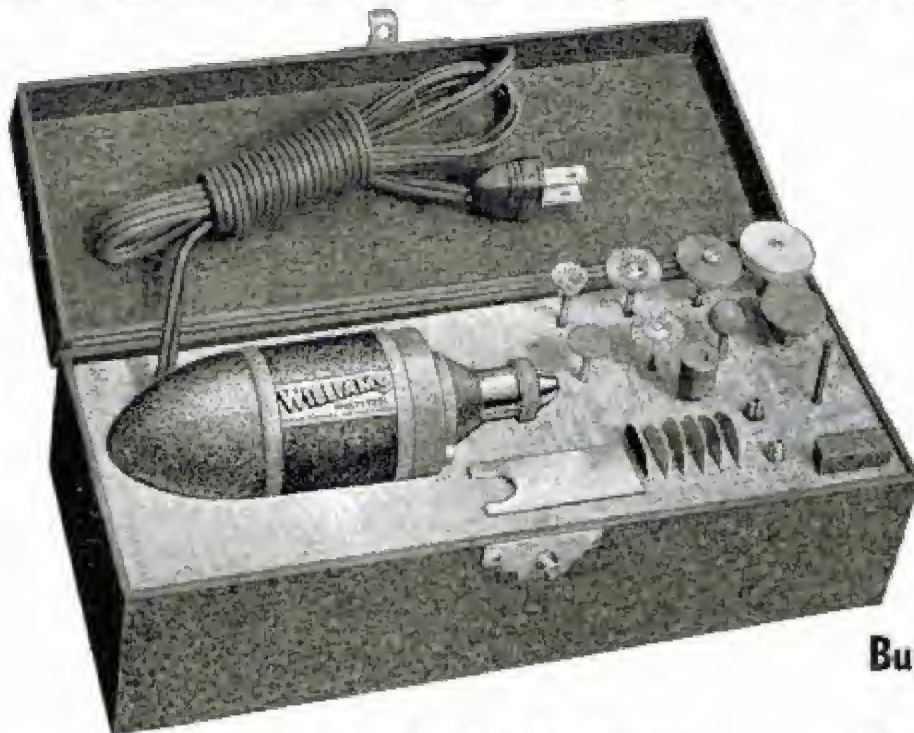
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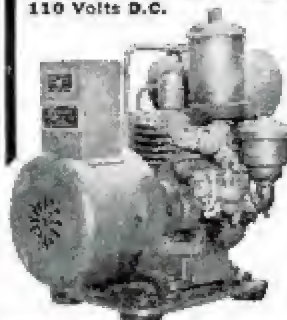
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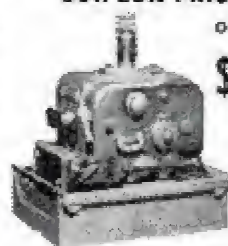
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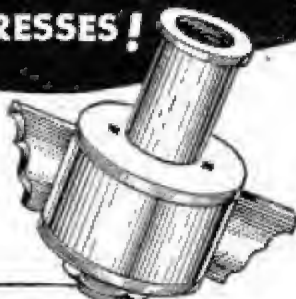


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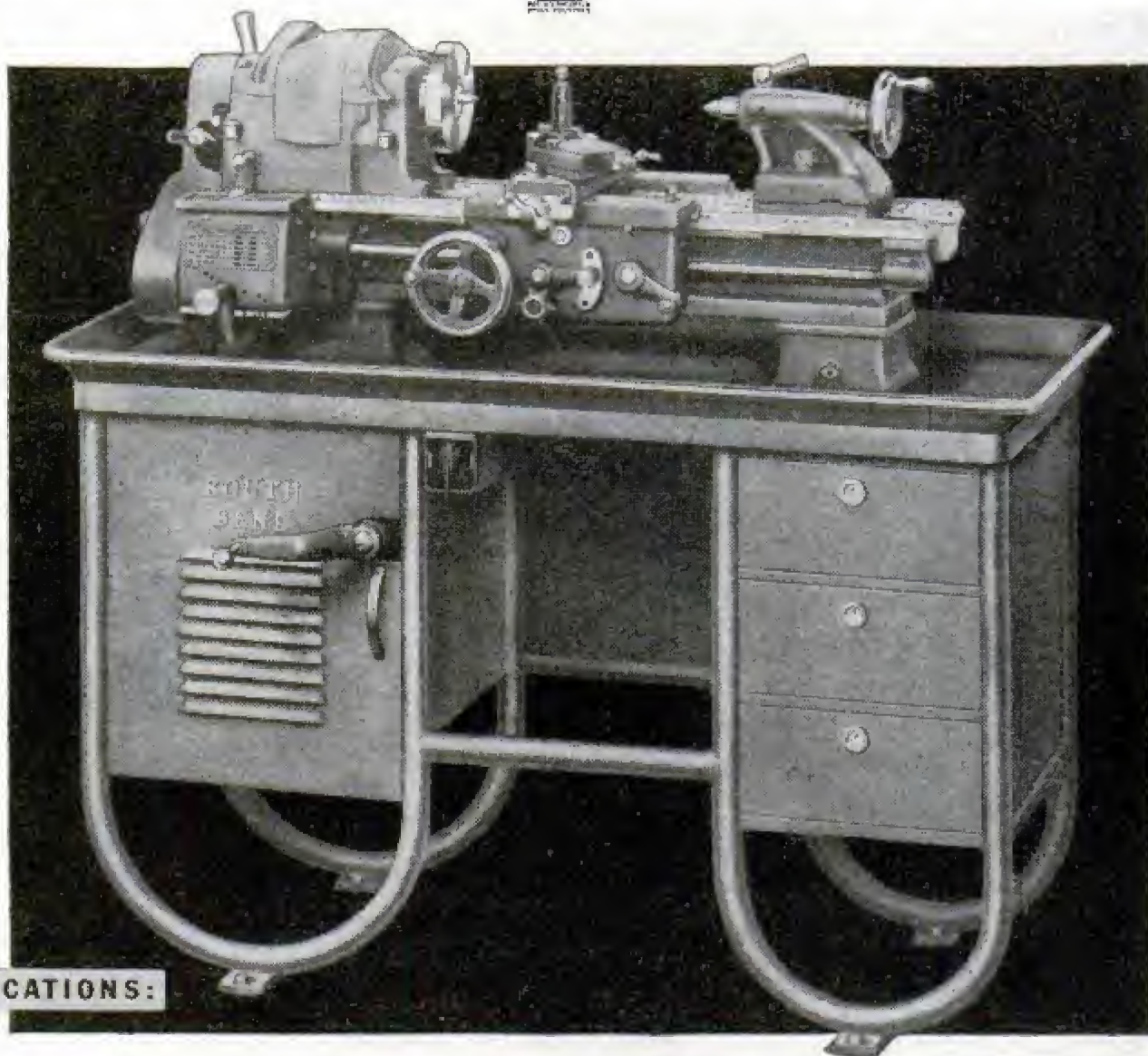
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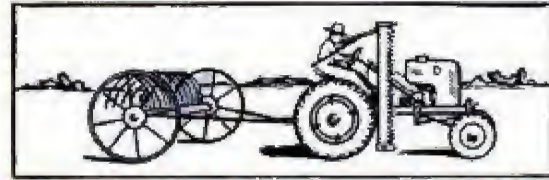
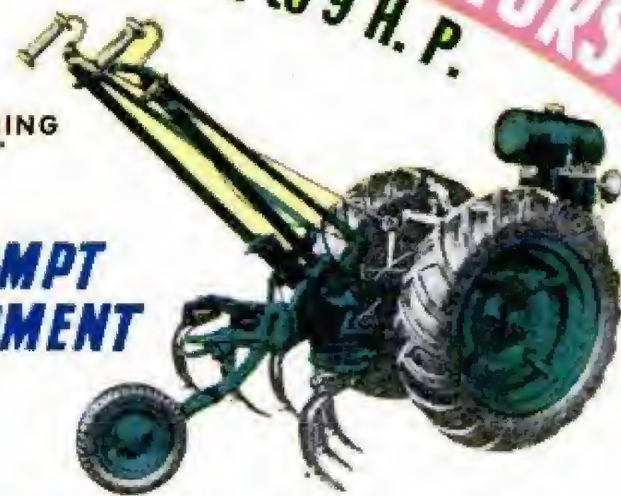
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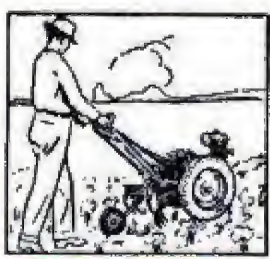


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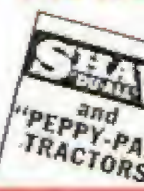
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